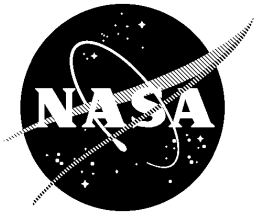
530-SIP-NCCDS/1998

MISSION OPERATIONS AND DATA SYSTEMS DIRECTORATE

Network Control Center Data System (NCCDS), System Integration Plan, 1998

January 1997



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Goddard Space Flight Center
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Network Control Center Data System (NCCDS) System Integration Plan, 1998

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Preface

The Network Control Center Data System (NCCDS) System Integration Plan, 1998, 530-SIP-NCCDS/1998, provides the high-level approach and activities necessary to integrate the various segments of NCCDS 98. The scope of this document covers the initial integration of each major build of NCCDS 98 in the Development, Test and Training (DT&T) suite. The integration of NCCDS 98 includes the verification of both the hardware and the software interfaces introduced with each build. This document provides a high-level approach for demonstrating that each interface, hardware and software, has been adequately defined and implemented so as to produce a single, testable system.

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Abstract

The Network Control Center Data System (NCCDS) System Integration Plan, 1998 (530-SIP-NCCDS/1998), provides the high-level approach and activities necessary to integrate the various segments of NCC98 in the Development, Test, and Training (DT&T) facility.

Keyword: Network Control Center, integration, DT&T, SPSR, CCS, NPG, NSM, NFW, SAS, ACRS/TLAS

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Section 1. Introduction

1.1 Scope

The scope of this document covers the initial integration of each build of the Network Control Center Data System (NCCDS) 1998 (NCCDS 98) delivered to the Development, Test and Training suite (DT&T). The integration of NCCDS 98 includes the verification of both the hardware and the software interfaces introduced with each major build. This document describes the approach for demonstrating that each interface, hardware and software, has been adequately defined and implemented so as to produce a single, testable system.

1.2 Purpose

The purpose of the *Network Control Center Data System (NCCDS) System Integration Plan, 1998* is to provide a detailed approach for the integration of the hardware and software components that are to be incorporated in the NCCDS 98 delivery. The purpose of the activities outlined in this document is to ensure that the NCCDS is sufficiently integrated to support the start of the integration test phase. This determination will be based on established exit criteria and recommendations provided by the applicable development managers, the Integration Team, the Joint Integration and System Test Team (JISTT) Manager, and others.

1.3 Applicable Documents

The following documents and presentations contained referenced or related material:

Network Control Center Data System (NCCDS) System Requirements, 1998, 530-SRD-NCCDS/1998, August 1996.

Interface Control Document (ICD) Between the NCCDS and the Mission Operations Centers, 530-ICD-NCCDS/MOC, April 1996.

- CCR 530/996 - Document Change Notification (DCN) 001 - Transmission Control Protocol (TCP)/Internet Protocol (IP) and Kerberos, December 1996.
- CCR 530/997 - DCN 003 - Modifications for NCCDS 1998, October 1996.

Interface Control Document (ICD) Between the Network Control Center (NCC)/Flight Dynamics Facility (FDF) and the White Sands Complex (WSC), 530-ICD-NCC-FDF/WSC, Revision 4, June 1996.

Network Control Center Data System (NCCDS) System Design Specification, 1998, 530-SDS-NCCDS/1998, April 1996.

Network Control Center1998 (NCC98) Integration Test Plan, 530-ITP-NCCDS/1998, November 1995.

Mission Operation & Data Systems Directorate (MO&DSD) White Paper on SPSR Interfaces (Draft), June 1996.

Network Control Center 98 (NCC98) System Design Review (SDR), November 30, 1995

Network Control Center 98 (NCC98) Communications Control Segment (CCS) Build 1 Critical Design (CDR), February 15, 1996

NCCDS Service Planning Segment Replacement (SPSR) Critical Design Review (CDR), February 22, 1996

Network Control Center Data System (NCCDS) Protocol Gateway (NPG) Release 1 Design Review, June 19, 1996.

Network and Systems Management (NSM) Subsystem Design Presentation, June 1996.

1.4 Background

The original purpose of NCCDS 98 was to replace the current Service Planning Segment (SPS), which runs on a UNISYS 2200, to reduce related licensing and maintenance costs. The replacement system, the Service Planning Segment Replacement (SPSR), would move the SPS functions off of the UNISYS to a UNIX server. The SPSR would also introduce its own graphical user interface (GUI) for the management of the database and the Space Network (SN) schedule. The GUI would be run on workstations connected to the SPSR server via a local area network (LAN). The original scope for NCCDS 98 was to simply replace the SPS with the SPSR server and operator workstations.

Because of the proprietary interface between the SPS and the Communications and Control Segment (CCS), the scope of NCCDS 98 was broadened to include the CCS modifications necessary for CCS to access the SPSR database directly. The scope was again broadened to include a GUI for the CCS functions. The CCS GUI processes would run on the same operator workstations as the SPSR GUI processes, thus eliminating the Intelligent Terminal Segment (ITS). The final NCCDS 98 architecture evolved from the desire to introduce the most current, industry-standard technology to the NCCDS, while, at the same time, minimizing the changes to the existing CCS baseline.

Section 2. Integration Overview

2.1 NCCDS 98 System Overview

NCCDS 98 is the first step in migrating the NCCDS from the current proprietary system to an "open system" featuring a client/server architecture, substantial use of commercial off-the-shelf (COTS) products, and industry-standard communications protocols. After its completion, NCCDS 98 will feature the following components:

- the Service Planning Segment Replacement (SPSR)
- the Communications and Control Segment (CCS)
- the operator workstations, which provide the Graphical User Interface (GUI) for NCCDS 98
- the NCC Protocol Gateway (NPG)
- a modified Network Front End (NFE)
- the Network and System Manager (NSM)
- the NCC Firewall (Firewall)
- theNCC Central Delogger (NCD)
- the TDRS Unscheduled Time (TUT)/Nascom Event Schedule (NES) Information Web Server, hereafter referred to as simply the Web Server
- a Kerberos Key Distribution Center (KDC)
- the Service Accounting Segment (SAS)
- the Automated Conflict Resolution System (ACRS) Tracking and Data Relay Satellite (TDRS) Look-Angle System (ACRS/TLAS).

Each of these components will be connected to a single LAN, hereafter referred to as the OpsLAN, as depicted in Figure 2-1.

The development, integration, and testing of NCCDS 98 will be done in a "three-build" approach. These builds will be referred to as Build "A", Build "B", and Build "C".

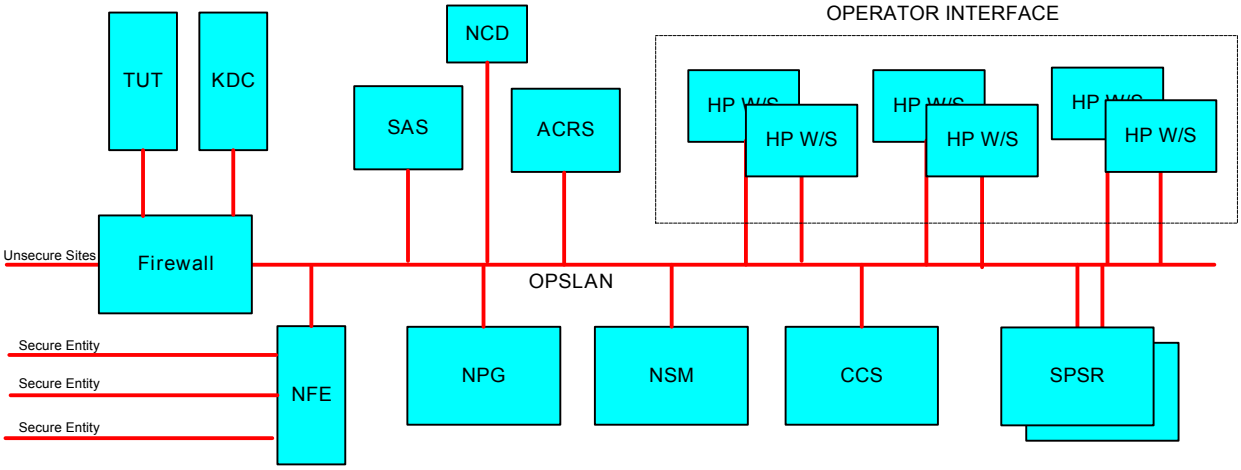

Figure 2-1. NCCDS 98 Architecture

2.1.1 NCCDS 98 Build "A" Overview

The contents of Build "A" of NCCDS 98 are focused on introducing the SPSR into the NCCDS's physical and functional architecture. The physical architecture for Build "A" of NCCDS 98 consists of the SPSR server; the operator workstations; the CCS, the first phase of the NSM, the NFE; and an Interim NPG (INPG), which will provide communications services to the SPSR and CCS. These components will be connected to LAN 1 of the existing Intersegment Network (ISN).

When compared with the current NCCDS baseline, some differences in the NCCDS 98 Build "A" functional architecture include

- the INPG will control the initialization and monitoring of the NFEs;
- the INPG will control communications with all 4800BB external entities, including the ground terminals, via the NFEs.
- direct communications between the SPSR and the INPG eliminates CCS's role as communications controller.
- direct communications between the INPG and the SPSR undoes CCS's role of communications controller for the NCCDS.
- the communication protocol for the CCS will be User Datagram Protocol (UDP)-encapsulated 4800-bit block (4800BB) datagrams;
- the removal of the Restricted Access Processor (RAP) monitoring and configuration software from the CCS;
- the CCS user interface will run on the operator workstations, replacing the ITS.

The physical NCCDS 98 Build "A" test configuration is shown in Figure 2-2.

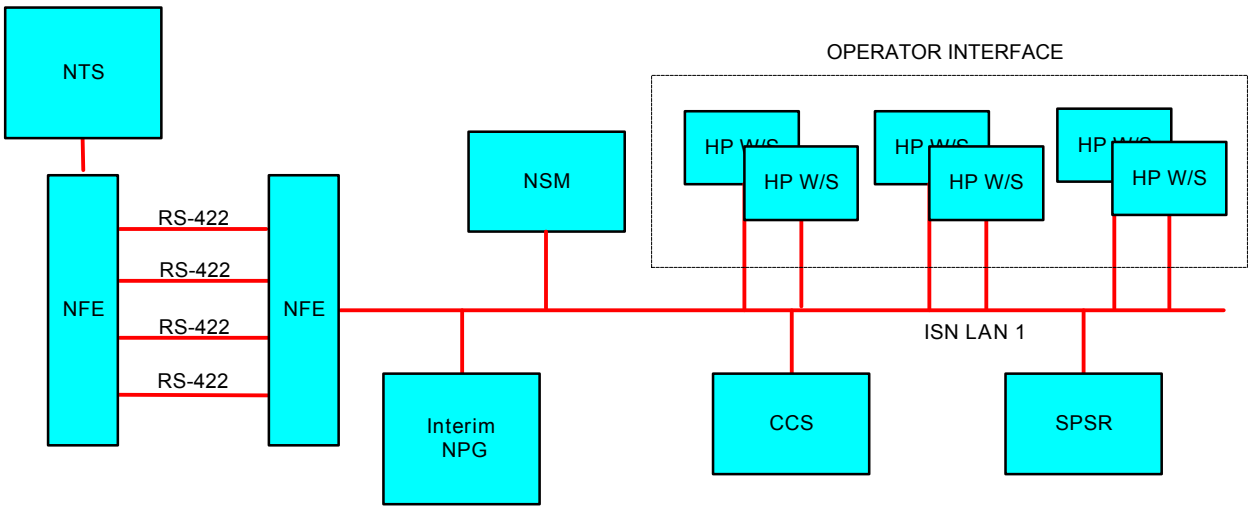

Figure 2-2. NCCDS 98 Build "A" Test Configuration

The test configuration NCCDS 98 Build "A" also includes the NCC Test System (NTS) and its associated NFE. These segments are required for the simulation of the NCCDS's external entities.

2.1.2 NCCDS 98 Build "B" Overview

The contents of Build "B", which are based on Build "A", focus on completing the SPSR-CCS interface and adding additional SPSR functionality. Specifically, the SPSR and its user interface are modified to support the generation and activation of batch schedules and the management of the active schedule. The CCS is modified to support the access of active event information and CCS authorized user information, and to write CCS-generated alerts to the SPSR database. The NCCDS Build "B" baseline will support the execution of the NCCDS Performance Benchmark (PBM). The physical test configuration for NCCDS 98 Build "B" is the same as Build "A," which is depicted in Figure 2-2.

2.1.3 NCCDS 98 Build "C" Overview

The contents of Build "C" of NCCDS 98 include the completed implementation of the SPSR, CCS, and NSM applications and introduce the final NPG, the Firewall, the KDC, the NCD, and the web server (as well as the SAS and ACRS) into the NCCDS's physical and functional architecture. The physical architecture for Build "C" of NCCDS 98 will also include redundant hardware for the SPSR server, the NPG, the CCS, the NFE, the NSM server, and the Firewall. The test architecture of NCCDS 98 Build "C" is shown in Figure 2-3.

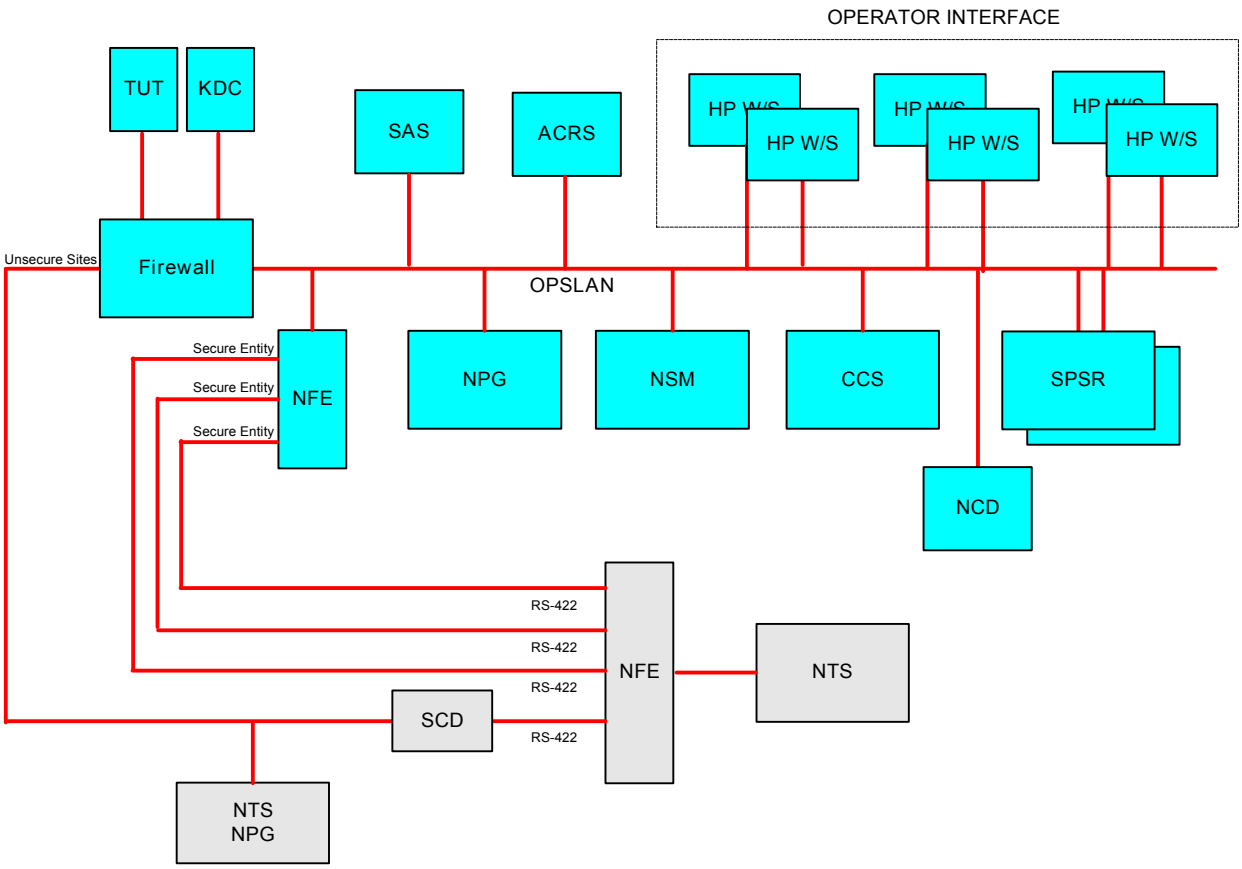

Figure 2-3. NCCDS 98 Build "C" Test Configuration

As in Build "A" and Build "B", the test architecture includes segments that are not part of the NCCDS 98 architecture. In addition to the NTS and its associated NFE, a Small Conversion Device (SCD) and a second NPG, hereafter referred to as the "NTS NPG," are used to simulate the external entities of the NCCDS. The roles of the SCD and the NTS NPG are described in detail later in this document.

2.2 Integration Approach

2.2.1 Purpose

The purpose of the system integration for NCCDS 98 is to perform the activities necessary to ensure that the integration test phase of each build can begin on schedule and be efficiently accomplished. This purpose implies that the system integration activities be capable of identifying discrepancies that would cause significant impact to the integration test schedule if left unresolved.

2.2.2 Integration Team

The system integration activities for NCCDS 98 will be performed by an Integration Team. This team will be facilitated by the NCCDS 98 Release Leader (RL) and consist of key members from

each development team, system administrators, configuration management (CM) personnel, and representatives of the Joint Integration and System Test Team (JISTT). For Build "A" and for Build "B", the development personnel will represent the SPSR, CCS, NSM, NTS, and the Interim NPG. For Build "C", development personnel from the Firewall, KDC, NCD, and the Web Server will also be added to the team. The development representatives will be required to support on an as-needed basis.

2.2.3 Entrance Criteria and Assumptions

The integration plan presented in this document is based on certain assumptions. The first assumption is that the SAS and ACRS/TLAS are not part of this plan. These segments will be integrated into the NCCDS 98 by their respective development groups.

Other assumptions will serve as criteria for initiating the integration activities (i.e., all assumptions must be made true before the integration activities will start). These assumptions are:

- the hardware necessary to perform this integration has been purchased and installed in the DT&T.
- the necessary COTS products and associated licenses have been purchased. Installation of the COTS products is unique to each segment. Those products that can be installed prior to any custom software should be.
- each development group has completed its internal unit and string testing activities.
- the software developed and/or integrated for installation on a particular segment has been placed under configuration management control.
- a fully populated database is available and resident on the SPSR server.
- the baseline inspection of each segment is completed with satisfactory results.

2.2.4 Methodology

The system integration activities will be performed in an order and manner so as to build the system from the ground up, segment by segment. This approach is consistent with the "build a little, test a little," methodology and provides verification of the high-risk interfaces earlier in the integration phase.

The activities to be performed for each segment include the following:

- baseline verification, including interface with any peripheral
- verification of its startup
- verification of its internal interfaces (if any)
- verification of its external communications interface (if any)

For each build, the integration of the system will focus primarily on the interfaces between the segments of NCCDS 98. Of course, each interface has some implicit system configuration information that is required for that interface to be realized. The verification of each interface, and its implicit configuration information, will be accomplished through some demonstrable

event or events. These events, and their expected results, are documented in appendices of this document. Once this document is finalized, the expected results, which are based on system requirements, design reviews, and general understanding, will be considered correct and will not be changed unless overwhelming evidence exists to support such a change. In order for a demonstrable event to be considered validated, it must repeatedly produce the expected results.

2.2.5 Problem Tracking, Resolution and Implementation

Potential discrepancies identified during the System Integration period will be documented, tracked, and resolved in accordance with similar processes established for the Integration Test and System Test phases. A brief high-level description of this process with respect to the system integration period is included below.

When the observed results are different than the expected results, a discrepancy will be noted. Discrepancies identified during the integration period will be documented and resolved as quickly as possible. The Integration Team will analyze each discrepancy to determine if a baseline change is required to resolve the discrepancy.

If a baseline change is required, then a discrepancy report will be written. The Release Leader will assign the responsibility for resolving the discrepancy report to a specific group or groups. Discrepancies related to an interface between segments for which a resolution cannot be agreed upon will be assigned to the Problem Report Resolution Board (PRRB) for direction. The discrepancy report will serve as the vehicle for changing software, configuration files, or data that has been placed under CM control. The discrepancy reports, if any, and their resolutions will be tracked and processed in accordance with the problem resolution process adopted for NCCDS 98.

2.2.6 Configuration Management

The baseline used for the system integration activities will be under configuration management control. Therefore, changes to the system will be performed in compliance with the applicable CM plan(s). One aspect of any such CM plan is that changes to the established baseline cannot be made without an appropriate and approved work order (e.g., discrepancy report).

NOTE

As the integration process identifies problems, it may be advantageous to perform a significant amount of problem analysis "on the fly." As a result, the established baseline may be changed temporarily to evaluate a problem's resolution or to circumvent a problem so that additional activities can proceed. However, permanent changes to the established baseline must be accomplished via an approved work order and propagated to the established baseline through applicable CM practices.

2.2.7 Completion Criteria

The activities related to the system integration of each build will be considered complete after each interface has been satisfactorily verified (i.e., each demonstrable event has been validated) and no outstanding high-priority discrepancy reports remain open.

2.3 Facilities

The NCCDS 98 architecture will be reproduced in several environments within the Goddard Spaceflight Center (GSFC) Building 13. The initial NCCDS 98 system configuration was created for the various development groups and is located in several interconnected development facilities. These development facilities include the SPSR Development Environment (SDE) and the Intermediate SPSR Test Environment (ISTE) in GSFC Building 13; the Software Engineering Research Facility (SERF) in GSFC Building 12; and the Software Development Facility (SDF) in GreenTec I.

This plan covers the integration of the NCCDS 98 system in the Development, Test, and Training (DT&T) facility in GSFC Building 13. The DT&T will be designed such that it can become the operational system in cases of need. Therefore , the DT&T will have the redundancy required to test the failover capabilities of a segment, when applicable. The operator workstations for the DT&T system will be contained in two distinct areas of Room 262. These areas will hereafter be known as the Second Test Berth (2TB) and the Third Test Berth (3TB).

NOTE

The "First Test Berth" is actually the existing ITS suite, which is located in GSFC Building 13, Room 180. This ITS suite will be maintained to support any critical development activities that may be required for the existing NCCDS baseline.

The second test berth will be the primary location of the workstations used to test NCCDS 98 Build "A" and Build "B". An additional workstation for the NPG will be added for Build "C" testing. The proposed layout for this test suite is depicted in Figure 2-4. The second test berth will contain

- six (6) operator workstations with monitors, keyboards, and mouse. One of these workstations will also serve as the NSM client workstation.
- one (1) CCS terminal
- one (1) NTS system console with BJ-80 printer
- one (1) PC with CNE connection and dedicated printer
- one (1) networked printer with connection to the DevLAN (eventually OpsLAN)
- one (1) WYSE NTS user terminal
- one (1) NTS Line Printer
- one NPG Release 2 workstation (Build "C")

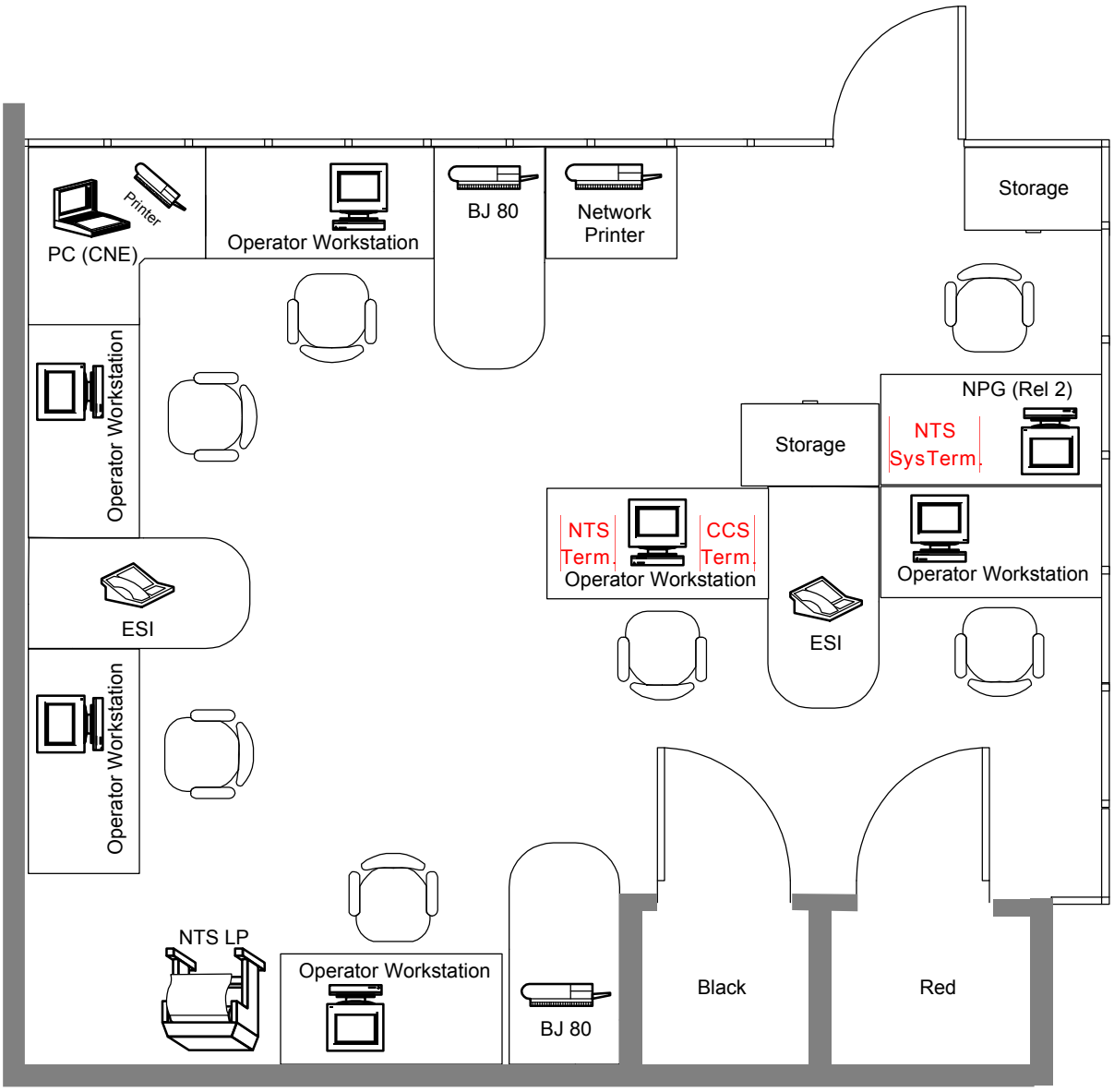

Figure 2-4. Proposed Configuration of Second Test Berth

The proposed layout for the 3TB is depicted in Figure 2-5. With the exception of the SPSR server, the NSM server, and some X-stations, the integration of the 3TB will be completed during Build ”C”. For Build “A” and Build “B”, the 3TB will only be used for the development of the Performance Benchmark. For Build ”C”, the 3TB can be used in combination with the 2TB for stress testing and SPSR server switchover testing. Because the second SPSR server will have an independent disk array, the test berths can be configured to operate a two separate strings of test equipment. In addition, because it contains the necessary hardware, the 3TB will be used to support operations if needed. The 3TB will contain

- two (2) SPSR servers (one for Build “A” and Build ”B”; a second one added for Build ”C”)
- four (4) operator workstations with monitors, keyboards, and mouse. One of these workstations will also serve as the NSM client workstation.
- one (1) NPG Release 2 workstation (Build “C”)
- two (2) NSM servers (one for Build ”A” and Build “B”; a second one added for Build ”C”)
- four (4) X-stations (Build ”A”)
- one (1) CCS terminal
- one (1) NTS system console with printer
- one (1) PC with CNE connection and dedicated printer
- one (1) networked printer with connection to the OpsLAN
- one (1) NTS Line Printer

The other equipment, and its location, required to configure complete test strings is listed below.

- CCS3 and CCS4 will remain in Room 262.
- NFE5 and NFE6 remain in Room 262.
- NFE3 and NFE4 will remain in Room 141.
- NTS1 and NTS2 will remain in Room 180.
- the Interim NPGs (INPG) will be located in Room 180 (Build “A” and Build “B”).
- the NTS SCDs will be installed in Room 262 (Build ”C”).
- the NTS NPG will be located in Room 262 (Build ”C”).
- the Firewall will be located in Room 262 (Build ”C”).
- the Kerberos Key Distribution Center (KDC) server will be located in Room 262 on a subnet of the Firewall (Build ”C”).
- the web server will be located in Room 262 on a subnet of the Firewall (Build ”C”).
- the NCD will located in Room 262 (Build ”C”).

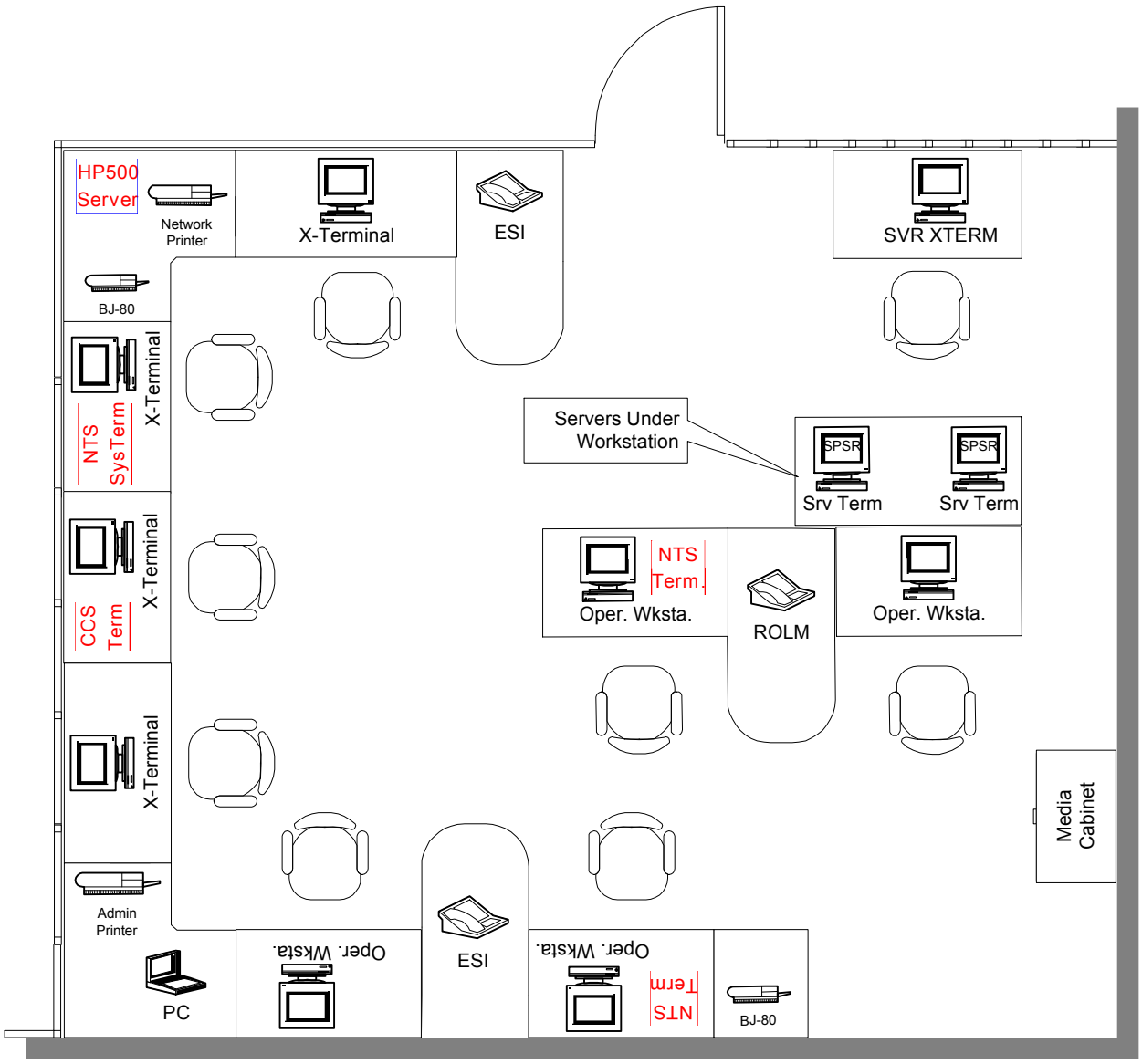

Figure 2-5. Proposed Configuration of Third Test Berth

2.4 Interfaces

The interfaces introduced with NCCDS 98 can be broken down into two basic areas: external interfaces and internal interfaces. The external interfaces deal with the ability of the NCCDS to communicate with external entities, such as customers, ground terminals, and support facilities. The particular NCCDS 98 segments associated with a specific external interface depend on the communication protocol, the security needs, and the services required by the external entity. The specific external interfaces will be detailed later in this document.

The internal interfaces introduced with NCCDS 98 provide access and exchange of SN data and the configuration and control of the NCCDS. The access and exchange of SN data is the fundamental need for the NCCDS. In general, the SPSR is the centralized keeper of the data. This data is accessed and exchanged by the GUI clients resident on the workstations, as well as the CCS, ACRS/TLAS, and SAS. The data that is propagated to these segments is then accessed by other user interface processes as well as their respective applications software. The configuration and control of the NCCDS includes determining the internal make-up of the NCCDS network, the security information used to control access to the system resources, and various tables that define external communications, such as message routing and connection status. The specific internal interfaces of each build will be detailed later in this document.

2.5 Simulation of External Entities

The testing of NCCDS 98 will require the simulation of all external interfaces of the NCC. The external entities to be simulated can be partitioned into the following classifications:

- Formatted messages or other type of interface
- Transmission Control Protocol (TCP)/Internet Protocol (IP)-based or 4800-Bit Block
- Kerberised (i.e., using Kerberos for I&A) or not (for TCP/IP-based entities)
- scheduling or real-time services
- “Front Door” (networked) or “Back Door” (point-to-point)

This partitioning and the NCCDS 98 build being integrated determine the external interfaces to be simulated, and which NCCDS 98 segments and test tools are involved. Additional details related to the roles and protocols of simulating external communications are provided in Appendix D.

In general, the NTS is used to simulate all external entities. During the execution of tests, the NTS will simulate the external interfaces by receiving formatted messages from and/or transmitting formatted messages to the NCCDS in 4800BB protocol. Transmissions by the NTS will be controlled manually, via timeline commands, or through normal responses to received messages. Through message logging, the NTS will also capture the results of message processing during test execution.

However, because the NTS will remain 4800BB, it cannot simulate all NCCDS 98 external interfaces by itself. Therefore, the simulation of all external interfaces will require test tools in addition to the NTS.

2.5.1 NCCDS 98 Build ”A” and Build “B” Simulation

For NCCDS 98 Build ”A” and Build “B”, the simulation of external interfaces will be limited to messages to/from 4800BB-based entities - ground terminals, Mission Operations Centers (MOCs), and the Sensor Data Processing Facility (SDPF). This limitation is due to the dependencies among segments and the implementation schedules for each segment. Therefore, the NTS can be used to simulate all external interfaces supported by NCCDS 98 Build ”A” and Build “B”. Refer to Figure 2-2 for the NCCDS 98 Build ”A” (and Build “B”) architecture.

2.5.2 NCCDS 98 Build ”C” Simulation

For the final build of NCCDS 98, the number of external interfaces, and the complexity of simulating them, is greatly increased. In addition to the full implementation of the SPSR external communications, the Nascom IP transition introduces another protocol that the NCCDS must support. With the Nascom transition to IP, unsecure MOCs that remain 4800BB-based (i.e., do not become TCP/IP MOCs) will have the 4800BB encapsulated in a UDP datagram for delivery through the Nascom IP network. The NPG will support the conversion of the UDP datagram into the applicable NCCDS protocol.

As in Build ”A”, the CCS will communicate via the NPG in UDP-encapsulated 4800BBs. However, it should be clearly stated that Nascom’s UDP encapsulation and CCS’s UDP encapsulation are different. The Nascom UDP encapsulation, which hereafter will be referred to as SCD protocol, includes a Real-Time Protocol (RTP) payload for sequence numbering and format type fields. Conversely, because the CCS does not require these fields, the NCC adopted a UDP encapsulation scheme that did not use the RTP payload. Therefore, the “Final” NPG must support three different types of external protocols: Nascom’s SCD protocol, the NFE’s proprietary Front End LAN (FEL) protocol, and standard TCP/IP. Furthermore, for TCP/IP interfaces, the NPG must support both Kerberised and non-Kerberised connections.

The tools, in addition to the NTS, required for the simulation of the external interfaces (and their respective protocols) supported by NCCDS 98 Build ”C” are described in more detail below. Refer to Figure 2-3 for the NCCDS 98 Build ”C” architecture.

2.5.2.1 NTS NPG

Because the NTS will remain 4800BB-based, the NTS NPG will be used to simulate TCP/IP external entities. [See Note 2.5.2.1-1] This simulation includes both Kerberised and non-Kerberised MOCs. In this role, the NTS NPG must be configurable for the following:

- endpoint definition tables that provide the Nascom message parameters to satisfy the NTS, including the generation of acknowledgments
- endpoint definition table that supplies the information necessary to format the Schedule Result Request (SRR) message when establishing the Schedule Status service connection.
- Kerberos client software to perform credential exchange and data assurance and encryption, preferably through General Security Services-Application Programming Interface (GSS-API); this feature includes the ability to be configured for inter-realm and cross-realm authentication. [See Notes]

NOTE

The use of the NTS NPG to simulate TCP/IP MOCs is still TBD. The TCP/IP MOC interface could possibly be simulated through a workstation running Release 11 of the User Planning System (UPS).

NOTE

The simulation of a second KDC for cross-realm authentication is TBD.

In addition to the simulation of TCP/IP MOCs, the NTS NPG will also be used to simulate other types of external interfaces. Specifically, the NTS NPG will:

- simulate the Nascom Domain Name Service (DNS); this feature is required to verify that the query-response interface between the NCC DNS, controlled by the NSM, and the Nascom DNS. This interface also requires the appropriate configuration of the Firewall.
- simulate the Nascom Operations Center (NOC) for exchange of SCD endpoint definition tables with the NCC NPG. This interface also requires the appropriate configuration of the Firewall.
- provide a web browser in order to interface with the Web Server to access TUT and Nascom Schedule information. This interface also requires the appropriate configuration of the Firewall.
- provide terminal emulation to verify that the Firewall denies access to the NCCDS from an external node.

2.5.2.2 Small Conversion Device (SCD)

Because of the time relationship between the Nascom IP Transition and NCCDS 98, the NTS NPG will convert between TCP/IP and the Nascom SCD protocol. Because the NTS will remain pure 4800BB, a SCD is needed to encapsulate 4800BB into Nascom SCD protocol. In this role, the SCD is a “hop” for every message exchanged with the NTS on the simulated Nascom IP network. Furthermore, in order to simulate the external SCDs being deployed throughout the Nascom SCD Net, this SCD should have the ability to support IP multicasting and Internet Group Management Protocol (IGMP).

Section 3. NCCDS 98 Build A Integration and Verification

The activities necessary to verify that NCCDS 98 Build A is integrated successfully are outlined in the sections below.

3.1 NCCDS 98 Build A Segments

Prior to verifying the interfaces between the various segments of NCCDS 98 Build A, the integrity of each segment will be verified standalone. The integrity check for each segment will focus on the installation and configuration of the hardware and software for that segment. A high-level overview of these integrity checks is presented in the appropriate sections below.

3.1.1 SPSR Server

3.1.1.1 Hardware

There will be a single SPSR server located in the third test berth. This server will be an HP 9000 K-Class server with 384 MB of main memory. The server will also have an 12 GB system disk and an 8 GB applications disk. The server will have a 48 GB Digital Data Storage 2 (DDS2) Autoloader Digital Audio Tape (DAT) drive with 4 or 8 GB capacity. The server also has a dedicated operator terminal with standard keyboard and mouse.

The server will run the most current, stable version of the HP-UX operating system, which is currently HP-UX 10.10.

3.1.1.2 Software

The SPSR software will be developed and baselined in the SPSR Development Environment (SDE) in GSFC Building 13, Room 213. The software will be placed under CM control and compiled as a single baseline in the SDE. This single baseline will be propagated to the SPSR server in the DT&T.

The first build of the SPSR software for NCCDS 98 will contain everything required to integrate it within the NCCDS architecture. The SPSR contents for Build A include the full implementation of the Database Subsystem, and partial implementations of the Scheduling Subsystem, the Input Subsystem, the Output Subsystem, and the Utility Subsystem.

For Build A, the Scheduling Subsystem will provide the capability to determine and control the Batch Schedule Boundary time. This boundary is used to determine if a schedule request is to be placed on the Automatic Queue or stored for batch scheduling. The Build A implementation will update the Batch Boundary time and place the stored

requests affected by the update on the Automatic Queue. This part of the Scheduling Subsystem interfaces with the Database Subsystem only.

For Build A, the Input Subsystem will be capable of receiving, validating, and storing Customer Schedule Request messages - Schedule Add Requests (SARs), Alternate SARs, Replace Requests, Delete Requests, and Wait List Requests - and TDRS Scheduling Window (TSW) messages. Receiving the Customer Schedule Requests and TSW messages implies that the Input Subsystem will support a Transmission Control Protocol (TCP)/Internet Protocol (IP) (TCP/IP) service connection for each external customer.

For Build A, the Output Subsystem will be capable of sending the initial Schedule Result Message (SRM) to the applicable customer. These initial SRMs are sent in response to a Customer Schedule Request. The SRM contains information indicating the requests validity and/or approval by the NCCDS. The transmission of the SRM occurs via a TCP/IP service connection for each external customer. These service connections are established by the Interim NPG (as a proxy for each MOC) by transmitting a valid Schedule Result Request (SRR) message to the SPSR. The SRR message is being introduced with NCCDS 98 and is used by the SPSR to map Support Identification codes (SUPIDENs) to specific service connections for each logical destination.

The Utility Subsystem provides features that are common to SPSR processes from various subsystems. These features include Alert Processing, Data Logging, Trigger Registration, and the Application Framework.

3.1.1.3 Database

The Database Subsystem will be based on an Oracle 7 Relational Database Management System (DBMS). However, from an external perspective, the Database Subsystem consists of a collection of classes. To mesh the relational database with the object-oriented design, the database schema will be derived from the class definitions. Furthermore, SPSR and CCS Application Clients will access the database via Persistent Class Library, which provides an object-oriented interface into the relational database. Conversely, Database Maintenance Utilities will interface with the database directly through the Structured Query Language (SQL).

The Database Subsystem will support the generation of triggers in Build A. The triggers serve as notification that a certain event has occurred or a specific set of conditions currently exist. These triggers are then used by other asynchronous objects or processes to initiate their execution. For Build A, triggers will be used to initiate the transfer of data from SPSR to CCS, to notify the operator of new alerts, and to initiate the transmission of Schedule Request Messages (SRMs).

A populated database will be produced using database migration utilities developed by SPSR development personnel. These utilities take flat files of data created from the current SPS and translate that data into the Oracle Relational DBMS and the delivered schema. This database will be fully populated for all static areas (tables) of the database; events and vectors are not included.

3.1.1.4 Verification

The verification of the hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture. This verification will be performed prior to the installation of any SPSR application software.

The verification of the software installation and configuration for SPSR will be realized through CM reports and exercising the SPSR system. This exercising will consist of booting the server and starting the SPSR application software. The Integration Team will verify that the startup script starts the necessary processes. This verification will also include the interface between the server and any peripherals, such as a printer, console, or tape drive. The activities related to the SPSR installation and configuration are listed in Section A.1.1.

The verification of the database will be done through DB reports and through exercising the system. The activities related to the installation and configuration of the DB are also listed in Section A.1.1.

3.1.2 Operator Workstation

3.1.2.1 Hardware

The operator workstations will be HP C-Class servers with 64 MB of memory. Each workstation will have a 2 GB system disk. Each workstation will have a dual-headed monitor which receive two (2) distinct video inputs, but are viewed by the application software as a single monitor. The workstations do not have a dedicated printer, but rather utilize a set of network printers on the LAN. The number of printers needed to provide the most cost-effective support has not been determined. The workstation has a port to support a portable tape drive. This tape drive is not required for NCCDS operations, but may be used for performing system backups.

Each workstation will run the most current, stable version of the HP-UX operating system, which is currently HP-UX 10.10.

3.1.2.2 Software

The software for the user interface will be developed by both SPSR and CCS development groups. While the groups are attempting to provide an interface which is "seamless," the software developed by the two groups is, for the most part, not coupled. The only point of coupling is the operator toolbar displayed to the operator upon successful login. Therefore, each group will develop the user interface software in their respective development environments. Each CM group will place their software into a controlled baseline and install it on the DT&T workstations independently. SPSR development is responsible for initial development of the integrated toolbar. However, once the toolbar configurations are determined to be stable enough, copies of the toolbars will be provided to the CCS development group. In this manner, each group can make updates and provide problem resolutions relatively independent of the other; however,

any changes must be coordinated between the groups so as to ensure the integrity of previous changes.

The User Interface (UI) Subsystem provides the GUI for the NCCDS operators. The GUI clients will run on the HP workstation and interface with the corresponding servers through CORBA registrations. For Build A, the SPSR portion of the UI Subsystem will supply all windows necessary to populate the database, process operator alerts, and edit SARs and TSWs. These windows will be accessible through the Main Panel (toolbar), which also provides access to recent operator alerts and several utility functions that provide the capability to change the workspace, print a window, access electronic mail, access a text editor, display Closed-Circuit Television (CCTV), view the Coordinated Universal Time (UTC), and log off the NCCDS 98 system.

The UI to the CCS applications will be changed to a Graphical User Interface (GUI) developed on an X-Window/Motif platform. The CCS portion of the UI subsystem provides the windows necessary to review the CCS schedule information, monitor and disseminate performance data, monitor and transmit ground control messages (GCM), and monitor and control the external interfaces to CCS. To perform these functions, CCS GUI clients will be running on the operator workstations. These GUI clients will translate GUI requests into a format that the baseline CCS software can interpret and process. Likewise, the GUI clients will also translate the baseline response into a format suitable for the GUI. As previously mentioned, these windows will be accessible from the Main Panel (toolbar) being developed by the SPSR development group.

3.1.2.3 Verification

The verification of the hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture. This verification will be performed prior to the installation of any GUI application software.

The verification of the software installation and configuration for the operator workstations will be realized through CM reports and exercising the operator workstation system. This exercising will consist of booting the operator workstations, starting the application software, and logging on to the workstation. The Integration Team will verify that the startup script starts all necessary processes. This verification will also include the interface between the workstation and any peripherals, such as a printer, monitor, and/or tape drive. The activities related to the operator workstation installation and configuration are listed in Section A.1.2.

3.1.3 CCS

3.1.3.1 Hardware

The CCS will continue to be a VAX 8550 computer system with 64 MB of memory. The CCS is supported by the DEC SA301-CA storage array system. The storage array consists of four (4) RA71 disks, each of which has a 700 MB capacity. The CCS has a

system console (Winchester), VT 220 terminals, printer, and 9-track, 1/2" reel-to-reel tape drives. The device control is maintained by the High-Speed Controller (HSC) 50.

The CCS will continue to run the OpenVMS VAX Version 6.1 operating system. This operating system is enhanced by Multinet, which is a COTS product used for network communications protocol stacks and communications support.

3.1.3.2 Software

The CCS software will generally be the current CCS baseline enhanced to eliminate the ITS (as discussed in the previous section), to integrate SPSR into the NCCDS, and to satisfy Automated Information System (AIS) Security Criticality (SC) Level 3 (AIS/SC3) security requirements. One of the foremost design decisions for NCCDS 98 was to keep the modifications to the existing CCS application software at a minimum.

In order to integrate the SPSR into the NCCDS, the CCS must be able to access the SPSR database and acquire the data necessary for the CCS to perform its functions of event and network monitoring. The access to the database will be achieved through two data clients, namely the CCS Event Data Client [see NOTE] and the CCS Static Data Client, that are resident on the SPSR server. The clients initiate that acquisition of the necessary data at CCS startup, when triggered by an update to the SPSR database, or when requested by an operator. These clients will interface with servers, called the Event File Builder and Static Data File Builder, respectively, that run on the VAX. These File Builders translate the SPSR data into a format that can be processed and interpreted by the existing CCS software.

NOTE

The CCS's access of event information from the SPSR database will be delivered in Build B.

In order to satisfy the AIS/SC3 security requirements, the CCS will be changed to communicate through the NPG via UDP-encapsulated 4800BB instead of pure 4800BB through the NFE. This change eliminates the need for the CCS software to configure and monitor the NFEs and the RAPs. This obsolete software will be removed from the baseline. In addition to this communications change, the Event Monitor process will be modified to support dynamic updates to the MOC passwords.

3.1.3.3 Verification

The verification of the hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture. This verification will be performed prior to the installation of any CCS application software for NCCDS 98.

The verification of the software installation and configuration for the CCS will be realized through CM reports and exercising the CCS system. This exercising will consist of booting the CCS and starting the application software. The Integration Team will verify that the startup script starts the necessary processes. This verification will also include the interface between the CCS and any peripherals, such as a printer, console,

and/or tape drive. The activities related to the CCS installation and configuration are listed in Section A.1.3.

3.1.4 Interim NPG

3.1.4.1 Hardware

The Interim NPG is a custom built embedded system that provides an Ethernet connection to the development LAN (DevLAN). The Interim NPG box is standard height and will be rack mounted in the NTS COMM rack (1 Interim NPG per NTS). The box will have a serial terminal interface port for display of status only (no keyboard entry). The Interim NPG will also have a LAN connection on the DevLAN to communicate with SPSR and the NCC NFE. The INPG requires an AUI LAN connection and can come with a transceiver if necessary.

3.1.4.2 Software

Software for the Interim NPG will be embedded on Programmable Read-Only Memory Chips (PROMs) installed on the interface boards. The software is required to establish TCP/IP service connections with the SPSR in order to test the communication between SPSR and external customers, which are simulated by the 4800-bit block based NCC Test System (NTS). The INPG will perform the protocol conversion between Nascom 4800-bit blocks for the NTS and TCP/IP messages for the SPSR. Likewise, the INPG will perform the protocol conversion between Nascom 4800-bit blocks for the NTS and UDP datagrams for the CCS. The INPG is also expected to multiplex outbound messages from CCS and SPSR on to the DevLAN according to Nascom protocol.

The software component also includes message routing logic to determine if a message or an acknowledgment is to be received by the CCS or the SPSR. The Interim NPG will also have Nascom protocol logic that controls communications between the SPSR and the NTS. This logic includes consuming acknowledgments for SPSR-originated messages, retransmissions for failed ACKs, aborting SPSR service connections after 3 failed ACKs, and CTM generation for re-establishing proxy clients for “downed” sites.

The INPG software must also support the configuration and monitoring of an NCC NFE. This includes initialization at start up, assigning the appropriate ports, exchanging life-test messages, and receiving error messages under certain conditions. Failover logic for both the NFE and for the NFE ports will not be implemented in the Interim NPG.

The configuration information will be downloaded through a utility on an operator workstation. This utility will provide the capability to define endpoints for the service connections with the SPSR, supply the necessary information for the INPG to properly format a Schedule Result Request (SRR) message for each endpoint, and supply the necessary Nascom information for the 4800BB interface. The Interim NPG will attempt to establish all service connections defined in these tables automatically. The Interim NPG will use a CTM to establish the existence of the 4800BB entity. Once that entity is “responding”, then the NPG will attempt to establish the applicable service connections. The NPG will continue attempting to establish the service connection until it is successful.

3.1.4.3 Verification

The verification of the hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture.

The verification of the software installation and configuration for the Interim NPG will be realized through exercising the Interim NPG system. This exercising will be performed when verifying the external interfaces. The activities related to the INPG installation and configuration are listed in Section A.1.4.

3.1.5 NSM

3.1.5.1 Hardware

The NSM central server will be an HP 9000 J-Class Workstation. This workstation model provides the following:

- Dual 120 Megahertz (MHz) PA-RISC 7200 processors
- 512 MB of memory
- a 2 GB disk drive for storing the operating system and software tools
- a 2 GB disk drive for storing the databases needed by the NSM
- 48 GB Digital Data Storage 2 (DDS2) Autoloader Digital Audio Tape (DAT) drive, expandable to 8 GB through typical compression
- a CD-ROM drive for software installation and upgrades
- 20” color monitor, standard keyboard and mouse.

The NSM will use one of the operator workstations as the NSM client console. The operator workstation serving as the client console will require an increase in memory to 128 MB. The client portions of the NSM COTS products will be installed on this single operator workstation. The NSM server can also act as a client console in the event that more than one operator is needed.

The server and the client consoles will run the most current stable version of the HP-UX operating system, currently HP UX 10.10.

3.1.5.2 Software

The NSM will consist of mostly COTS tools that are integrated to perform the system management functions for the NCCDS. For Build A, the COTS products are limited to the HP IT/Operations Center (IT/O) and HP NetMetrix. These products provide the following:

- HP IT/O - the framework for the integration for all NSM applications. This product acts as a Simple Network management Protocol (SNMP) element manager to perform status polling, provides limited event notification, and displays network topology and status. Partitioning of management

responsibilities is achieved by configuring HP IT/O to display different managed domains to different login groups. Additional system performance statistics will be gathered on managed nodes through intelligent software agents resident on the managed nodes.

- HP NetMetrix - a network performance analysis package that is integrated with HP IT/O. This software package manages and collects network performance data from hardware probes distributed at critical locations throughout the network. The software allows automatic collection of resource utilization statistics from SNMP- and RMON-compliant devices, both hardware and software, to provide trend analysis, capacity planning, and report generation, both for long-range and diagnostic purposes.

The COTS products will be integrated into a single baseline and propagated to the NCCDS Build A configuration. This propagation also includes the installation of SNMP agents and HP IT/O agents on each managed node for the collection of status and performance information.

3.1.5.3 Verification

The verification of the hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture. This verification will be performed prior to the installation of any NSM application software.

The verification of the software installation and configuration for the NSM server and workstations will be realized through CM reports and exercising the operator workstation system. This exercising will consist of booting the operator workstations and starting the application software. The Integration Team will verify that the startup script starts the necessary processes. This verification will also include the interface between the server and any peripherals, such as a printer, console, or tape drive. The activities related to the NSM installation and configuration are listed in Section A.1.5.

3.2 NCCDS 98 Build A Interfaces

Once the integrity checks for each segment are completed satisfactorily, the interfaces between the segments will be verified. These interfaces will be verified in the order presented below so as to build the NCCDS 98 Build A configuration from the ground up. Therefore, the interfaces presented prior to the specific interface being verified are assumed to be satisfactorily integrated.

3.2.1 SPSR <==> Operator Workstation Interface

Through the GUI clients developed for the SPSR, the operator workstation provides the console operators the capability to examine the data stored in the NCCDS database. The UI also allows the console operator to update the information in the database, initiate and terminate application processes that run on the SPSR server, and monitor other items

through CCTV and operator alerts. The GUI clients communicate with the SPSR server through CORBA calls.

For Build A system integration activities, Section A.2.1 describes the pieces of the SPSR<==>Operator Workstation interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, System Administration, and a JISTT representative.

3.2.2 CCS <==> Operator Workstation Interface

Through the GUI clients developed for the CCS, the operator workstation provides the console operators the capability to examine the data stored in the CCS data files. The UI also allows the console operator to view the information, update certain data files, and initiate and terminate application processes that run on the CCS. The GUI clients communicate with the CCS through CORBA calls.

For Build A system integration activities, Section A.2.2 describes the pieces of the CCS<==>Operator Workstation interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. For these integration activities, it is assumed that the CCS data files have been populated using the Static Tape Restore utility on CCS. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, CCS Development, System Administration, and a JISTT representative.

3.2.3 SPSR <==> CCS Interface

The SPSR <==> CCS interface is limited for NCCDS 98 Build A. Ultimately, this interface has three primary functions: to provide CCS with the necessary SN data from the SPSR database; to provide CCS with the necessary event information from the SPSR database; and to provide the operator with CCS-generated alerts generated by writing them to the SPSR database. However, for Build A, this interface will be limited to the exchange of Spacecraft information, Data Quality Monitoring (DQM) Setup Parameters, and TDRS-to-SGLT mapping information. In addition, the CCS will also access the Service Parameter information in the SPSR database in order to validate reconfiguration requests.

The exchange of Spacecraft information, DQM Setup Parameters, and TDRS-to-SGLT mapping information from the SPSR to the CCS is done through CCS clients resident on the SPSR server. The SPSR database generates triggers when particular types of updates occur for selected tables. These triggers are received by the CCS data clients, which then access the applicable data through Persistence. The data is then passed to the CCS through CORBA across the DevLAN. The CCS then builds the necessary data files in the format expected by the existing CCS applications. This transfer of data is also initiated at CCS startup and upon operator request.

For Build A system integration activities, Section A.2.3 describes the pieces of the SPSR <==> CCS interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, CCS Development, System Administration, and a JISTT representative.

3.2.4 NSM<==>SPSR Interface

The NCCDS 98 Build A interface between the NSM and the SPSR will monitor the stability of specific SPSR processes, perform status polling on the SPSR server, and gather system statistics through intelligent agents resident on the SPSR system.

For Build A system integration activities, Section A.2.4 describes the pieces of the NSM<==>SPSR interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, NSM Development, System Administration, and a JISTT representative.

3.2.5 NSM<==>Operator Workstation Interface

The NCCDS 98 Build A interface between the NSM and the operator workstations will monitor the stability of specific workstation processes, perform status polling on the operator workstations and gather system statistics through intelligent agents resident on the workstations.

For Build A system integration activities, Section A.2.5 describes the pieces of the NSM<==>operator workstation interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, CCS Development, NSM Development, System Administration, and a JISTT representative.

3.2.6 NSM<==>CCS Interface

The NCCDS 98 Build A interface between the NSM and the CCS will perform status polling on the CCS and gather system SNMP statistics through an SNMP agent (whatever is provided by Multinet) resident on the CCS system.

For Build A system integration activities, Section A.2.6 describes the pieces of the NSM<==>CCS interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, CCS Development, NSM Development, System Administration, and a JISTT representative.

3.2.7 INPG <==> NFE Interface

The INPG assumes the responsibility of configuring and monitoring the NFE within the NCCDS network (this responsibility is allocated to the CCS in the current NCCDS). Therefore, the INPG will exchange configuration and status messages with the NFE. The other aspects of the interface between the INPG and the NFE is exercised through the exchange of formatted messages between the NCCDS and the simulated external interfaces; which is covered in later integration activities. The INPG and the NFE will exchange messages using the existing FEL protocol currently used between CCS and the NFE.

For Build A system integration activities, Section A.2.7 describes the pieces of the INPG<==>NFE interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, INPG Development, System Administration, and a JISTT representative.

3.2.8 CCS <==> INPG Interface

The interface between the CCS and the Interim NPG (INPG) is only applicable to the exchange of formatted messages between CCS and the NTS. For messages from the NTS, the INPG identifies messages that are to be processed by the CCS and then encapsulates them in UDP datagrams addressed to the CCS. For messages from the CCS, the INPG decapsulates the datagram and routes the 4800BB (FEL packet) across the DevLAN to the appropriate NCC NFE port. If the message requests a 4800BB acknowledgment, the INPG ensures that such an acknowledgment is routed back to CCS. For messages it sends, the CCS retains the responsibility to ensure that the requested acknowledgment is received. Failure to receive such an acknowledgment will cause the CCS to "down" the appropriate site.

For Build A system integration activities, Section A.2.8 describes the pieces of the CCS<==>INPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, CCS Development, INPG Development, System Administration, and a JISTT representative.

3.2.9 SPSR <==> INPG Interface

The interface between the SPSR and the INPG is only applicable to the exchange of formatted messages between SPSR and the NTS. However, this interface is more complex than the CCS<==>INPG interface described in the previous section. As described in Section 2, the INPG must establish TCP/IP service connections with the SPSR, perform protocol conversion between 4800-bit blocks (FEL packets) and TCP/IP messages, and monitor acknowledgments and retransmissions. For messages from the NTS, the INPG identifies messages that are to be processed by the SPSR and then routes

them over the applicable service connection. For Build A, the SPSR will provide three services: the Schedule Request service, the TDRS Scheduling Window (TSW) Storage service, and the Schedule Result Status service. For messages from the SPSR, which would be over the Schedule Result Status service connection, the INPG converts the TCP/IP messages into 4800-bit blocks (FEL packets) and routes them across the DevLAN to the appropriate port of the NCC NFE. If such messages request a 4800BB acknowledgment, the INPG will ensure that such an acknowledgment is received and consume it. Failure to receive such acknowledgments will cause the applicable service connections to be closed.

For Build A system integration activities, Section A.2.9 describes the pieces of the SPSR<==>INPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, INPG Development, System Administration, and a JISTT representative.

3.2.10 SPSR/CCS <==> INPG Interface

The interface between the SPSR/CCS and the INPG is a combination of the interfaces described in the previous sections. The interface verification activities presented here are to verify that the INPG can handle concurrent message traffic with the SPSR and CCS. For messages outbound from the NCCDS, the INPG multiplexes the SPSR and the CCS messages together according to Nascom protocol and routes them across the DevLAN to the appropriate port of the NCC NFE. The INPG must also determine which acknowledgments to consume and which to pass on to CCS. However, this processing is functionally the same as that presented above.

For Build A system integration activities, Section A.2.10 describes the pieces of the SPSR/CCS<==>INPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, CCS Development, INPG Development, System Administration, and a JISTT representative.

Section 4. NCCDS 98 Build B Integration and Verification

The activities necessary to verify that NCCDS 98 Build B is integrated successfully are outlined in the sections below. NCCDS 98 Build B contents are primarily increased functionality for the SPSR and the completion of the CCS-SPSR interface. Because the changes to Build B are minimal and confined to CCS and SPSR, the integration activities will be focused toward the new contents and the CCS-SPSR interface.

4.1 NCCDS 98 Build B Segments

There are no new segments introduced with NCCDS 98 Build "B". However, due to substantial changes, these existing segments will be reexamined during this integration phase.

4.1.1 SPSR Server

4.1.1.1 Hardware

There are no SPSR hardware changes planned for NCCDS 98 Build B.

4.1.1.2 Software

The SPSR software for NCCDS 98 Build B will include additions to the implementations of the Scheduling Subsystem, the Input Subsystem, the Output Subsystem, and the User Interface Subsystem, as well as the introduction of the Acquisition Data Subsystem.

For Build B, the Scheduling Subsystem will provide the capability to generate and maintain a conflict-free schedule. Specifically, the Scheduling Subsystem will support the operator's ability to select requests to be included in a batch schedule run, initiate the generation of a batch schedule, manage multiple batch schedules, and activate a selected schedule. The Scheduling Subsystem will also manage the lock-out windows associated with the existence of a batch schedule. The implementation of batch scheduling in this build will also support request flexibility associated with event and service start time tolerances, selection of TDRS and single access (SA) antennas, and variable service durations.

The Scheduling Subsystem will also support the automatic scheduling of requests in the Automatic period. Specifically, the Scheduling Subsystem will verify that automatic scheduling is not paused or locked out by a batch schedule, automatically attempt to schedule a request submitted with a start time in the automatic scheduling period, and generate an SRM indicating the success or failure of the request. The Scheduling Subsystem will adjust existing events or the request within their respective flexibilities to provide a greater chance that the request will schedule successfully. The adjustments will

be based on the flexibilities associated with event and service start time tolerances, selection of TDRS and SA antennas, and variable service durations.

Nevertheless, the implementation of the Scheduling Subsystem in NCCDS 98 Build B will not be complete. Specifically, the Scheduling Subsystem will not support Alternate SARs, Replace Requests, Wait List Requests, or operator-generated Freeze Requests. Additionally, the Scheduling Subsystem will not support conflict resolution, schedule evaluation, or the generation and transfer of TUT information.

For Build B, the Input Subsystem will be capable of completely validating all schedule message from the MOCs. The complete validation is a result of establishing the interface between the Input Subsystem and the Scheduling subsystem. However, for this build, the Input Subsystem will not process any messages from the ground terminals.

For Build B, the Output Subsystem will be enhanced to support the initial activation mode transmissions. This transmission mode provides the capability to send the Schedule Result Message (SRM) or User Schedule Message (USM) to the applicable customer based on the results of batch scheduling. These messages are sent in response to an operator selecting and activating a batch schedule. The SRM for declined requests contains information indicating the reason the request could not be scheduled. The USM indicates that the request was successfully scheduled. The USM indicates the resources allocated to that event. In the case of a flexible event, the USM will be a Flexible USM which signifies that the allocated resources are subject to change. The Output Subsystem will also support the transmission of SRMs and, for baseline customers, Schedule Delete Notifications in response to a Schedule Delete Request. These messages are transmitted to all destinations to which a USM was sent.

A partial implementation of the Acquisition Data Subsystem will be introduced in NCCDS 98 Build B. The Acquisition Data Subsystem will support the reception, validation, and storing of Improved Interrange Vector (IIRV) messages. The Acquisition Data Subsystem will also support manual transmission of the vector data to the ground terminals. The Acquisition Data Subsystem will also support the operator's ability to inhibit the manual transmission of vectors by Spacecraft Identification Code (SIC). The transmission of vectors occurs over a TCP/IP service connection for each ground terminal. To receive vectors, the NPG, acting as a proxy for the ground terminal, must establish the applicable service connection and transmit a valid Vector Request (VR) message to the SPSR. The VR message, which is being introduced with NCCDS 98, allows the SPSR to map an IP address to a specific service connection for each ground terminal.

4.1.1.3 Database

For Build B, the database will be tuned to optimize performance. The tuning analysis and the introduction of the interface between the Scheduling Subsystem and the Database could result in modifications to the database. These changes are **TBD.**

For Build B, the Database Subsystem will support the generation of triggers in response to updating the active events and the CCS Authorized User information. The triggers

serve as notification that the current collection of event information or Authorized User information has been changed.

4.1.1.4 Verification

The verification of the software installation and configuration for SPSR will be realized through CM reports and exercising the SPSR system. This exercising will consist of booting the server and starting the SPSR application software. The Integration Team will verify that the startup script starts the necessary processes. This verification will also include the interface between the server and any peripherals, such as a printer, console, or tape drive. The activities related to the SPSR installation and configuration are listed in Section B.1.1.

The verification of the database will be done through DB reports and through exercising the system. The activities related to the installation and configuration of the DB are also listed in Section B.1.1.

4.1.2 Operator Workstation

4.1.2.1 Hardware

There are no hardware changes planned for the operator workstations for NCCDS 98 Build B.

4.1.2.2 Software

The SPSR UI Subsystem will supply windows necessary to generate and manage batch schedules, review and manage the active schedule, monitor the schedule transmission status, review and edit stored vectors; initiate the manual transmission of vectors to the ground terminals, define and review user interface channel information, define TDRS sets, and review and edit TSWs. These windows will be accessible through icons and pop-up menus on the Main Panel.

The CCS UI will be enhanced to complete the implementation of the window to initiate the transfer of data from the SPSR to the CCS. For this build, this transfer can be initiated for CCS Authorized User data or for active event information.

4.1.2.3 Verification

The verification of the software installation and configuration for the operator workstations will be realized through CM reports and exercising the operator workstation system. This exercising will consist of booting the operator workstations, starting the application software, and logging on to the workstation. The Integration Team will verify that the startup script starts all necessary processes. This verification will also include the interface between the workstation and any peripherals, such as a printer, monitor, and/or tape drive. The activities related to the operator workstation installation and configuration are listed in Section B.1.2.

4.1.3 CCS

4.1.3.1 Hardware

There are no hardware changes planned for the CCS for NCCDS 98 Build B.

4.1.3.2 Software

The CCS release for NCCDS 98 Build "B" will complete the implementation of the CCS interface with SPSR. The CCS will be enhanced to access the CCS Authorized User and Event information in the SPSR database. In conjunction with the access to these areas, the CCS Trigger Client will be modified to consume and react to database triggers generated by changes to these areas. Additionally, the CCS will introduce the components necessary to write alerts generated by the CCS application software to the SPSR Operator Alert table.

4.1.3.3 Verification

The verification of the software installation and configuration for the CCS will be realized through CM reports and exercising the CCS system. This exercising will consist of booting the CCS and starting the application software. The Integration Team will verify that the startup script starts the necessary processes. This verification will also include the interface between the CCS and any peripherals, such as a printer, console, and/or tape drive. The activities related to the CCS installation and configuration are listed in Section B.1.3.

4.1.4 Interim NPG

4.1.4.1 Hardware

There are no hardware changes planned for the INPG for NCCDS 98 Build B.

4.1.4.2 Software

For Build B, the INPG is required to format and send a VR message to the SPSR for each ground terminal. This message is required to establish TCP/IP service connections with the SPSR for the transmission of vectors to the ground terminals. The INPG will send this message after verifying that the respective ground terminal is "responding." While this software may be part of the INPG Release for Build A, the acquisition data service connection cannot be validated until SPSR introduces the Acquisition Data Subsystem in Build B.

4.1.4.3 Verification

The verification of the software installation and configuration for the Interim NPG will be realized through exercising the Interim NPG system. This exercising will be performed when verifying the external interfaces. The activities related to the INPG installation and configuration are listed in Section B.1.4.

4.1.5 NSM

4.1.5.1 Hardware

There are no hardware changes planned for the NSM for NCCDS 98 Build B.

4.1.5.2 Software

Modifications to the NSM for Build B include **TBD**

configuration changes to monitor processes introduced in this build.

4.1.5.3 Verification

The verification of the software installation and configuration for the NSM server and workstations will be realized through CM reports and exercising the operator workstation system. This exercising will consist of booting the operator workstations and starting the application software. The Integration Team will verify that the startup script starts the necessary processes. This verification will also include the interface between the server and any peripherals, such as a printer, console, or tape drive. The activities related to the NSM installation and configuration are listed in Section B.1.5.

4.2 NCCDS 98 Build B Interfaces

Once the integrity checks for each segment are completed satisfactorily, the interfaces between the segments will be verified. These interfaces will be verified in the order presented below so as to build the NCCDS 98 Build B configuration from the ground up. Therefore, the interfaces presented prior to the specific interface being verified are assumed to be satisfactorily integrated.

4.2.1 SPSR <==> Operator Workstation Interface

Changes to the SPSR <==> Operator Workstation interface are relatively minor. These changes are the introduction of new windows for managing batch schedules, managing the active schedule, and the transmission of USMs and acquisition data messages. However, some of these new windows provide the capability to initiate asynchronous processes, such as batch scheduling, on the SPSR server.

For Build B system integration activities, Section B.2.1 describes the pieces of the SPSR<==>Operator Workstation interface that will be verified; what demonstrable event will be used to verify each piece, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, System Administration, and a JISTT representative.

4.2.2 CCS <==> Operator Workstation Interface

Changes to the CCS<==> Operator Workstation interface are relatively minor. These changes are limited to the completion of the window for initiating the transfer of static data and event information. In addition, the Alert GUI will also be able to display CCS-generated alerts. However, this last item will be verified in the next section with the SPSR <==> CCS interface verification activities.

For Build 2 system integration activities, Section B.2.2 describes the pieces of the CCS<==>Operator Workstation interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, CCS Development, System Administration, and a JISTT representative.

4.2.3 SPSR <==> CCS Interface

The SPSR <==> CCS interface is the primary focus of NCCDS 98 Build B. This interface has three primary improvements: to provide CCS with the necessary CCS Authorized User information from the SPSR database; to provide CCS with the necessary event information from the SPSR database; and to provide the operator with CCS-generated alerts generated by writing them to the SPSR database.

For Build B the exchange of SN data from the SPSR to the CCS will include event information and CCS Authorized User information. The exchange of this data follows the same general approach as Build "A". However, the exchange of event information is much more dynamic than the other "static" data areas. The exchange of event information will be triggered by transmissions of schedule messages to the ground terminals.

The process for providing the operator with CCS-generated alerts is done through a CCS server resident on the SPSR server. The existing CCS application software generates an alert and writes it to the existing ALQ1 mailbox. The CCS alert client reads the alert from the mailbox, maps it to an alert ID, and passes the timestamp, the alert text, applicable TDRS and SIC information, and the alert ID to the CCS alert server. The CCS alert server then writes the information to the SPSR database. The alert ID is pre-defined in the SPSR database and determines the operator group(s) and priority (i.e., action or information alert) for that alert. From this point, the access to the CCS-generated alert by the NCC operator is the same as that for SPSR alerts.

For Build B system integration activities, Section B.2.3 describes the pieces of the SPSR <==> CCS interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, CCS Development, System Administration, and a JISTT representative.

4.2.4 NSM<==>SPSR Interface

The NCCDS 98 Build B interface between the NSM and the SPSR will be modified to monitor specific processes running on the SPSR server introduced in this build. This includes CCS developed processes for the exchange of event information and alerts as well as those developed by SPSR for schedule generation and management. Other objectives of this interface, such as performing status polling on the SPSR server and gathering system statistics, remain unchanged.

For Build B system integration activities, Section B.2.4 describes the pieces of the NSM<==>SPSR interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, NSM Development, System Administration, and a JISTT representative.

4.2.5 NSM<==>Operator Workstation Interface

The NCCDS 98 Build B interface between the NSM and the operator workstations will be modified to monitor the stability of specific processes introduced in this build, if any. Other objectives of this interface, such as performing status polling on the workstations and gathering system statistics, remain unchanged.

For Build B system integration activities, Section B.2.5 describes the pieces of the NSM<==>operator workstation interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, CCS Development, NSM Development, System Administration, and a JISTT representative.

4.2.6 NSM<==>CCS Interface

Currently, there are no planned modifications to the NSM <==> CCS interface for Build B. Therefore, this interface will be validated through previously demonstrated events.

4.2.7 INPG <==> NFE Interface

Currently, there are no planned modifications to the INPG <==> NFE interface for Build B. Therefore, this interface will be validated through other activities that use this interface.

4.2.8 CCS <==> INPG Interface

Currently, there are no planned modifications to the INPG <==> CCS interface for Build B. Therefore, this interface will be validated through other activities that use this interface

4.2.9 SPSR <==> INPG Interface

The interface between the SPSR and the INPG will change for NCCDS 98 Build B. Specifically, the INPG must format and send a VR message to the SPSR for each ground terminal in order to establish TCP/IP service connections for the transmission of vectors. Furthermore, the INPG must also support the transmission of vectors to the ground terminals by selecting the proper NFE port for the outgoing message and by translating the vectors from a TCP/IP stream into TDRSS 4800BB format. While the INPG software to support this may be delivered with Build A, the SPSR software that completes this area of the interface will not be delivered until Build B.

For Build B system integration activities, Section B.2.6 describes the pieces of the SPSR<==>INPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, INPG Development, System Administration, and a JISTT representative.

4.2.10 SPSR/CCS <==> INPG Interface

The interface between the SPSR/CCS and the INPG is a combination of the interfaces described in the previous sections. The interface verification activities presented here are to verify that the INPG can handle concurrent message traffic with the SPSR and CCS including the vector reception and transmission features added in this build. For messages outbound from the NCCDS, the INPG multiplexes the SPSR and the CCS messages together according to Nascom protocol and routes them across the DevLAN to the appropriate port of the NCC NFE. However, this processing is functionally the same as that presented above.

For Build B system integration activities, Section B.2.7 describes the pieces of the SPSR/CCS<==>INPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, CCS Development, INPG Development, System Administration, and a JISTT representative.

Section 5. NCCDS 98 Build ”C” Integration and Verification

This build of NCCDS 98 is also the final build planned. Therefore, NCCDS 98 Build ”C” is equivalent to simply saying NCCDS 98. Therefore, in the following sections, the distinction of NCCDS 98 Build ”C” will only be used when needed for clarity.

5.1 NCCDS 98 Build ”C” Segments

As with previous integration activities, prior to verifying the interfaces between the various segments of NCCDS 98 Build ”C”, the integrity of each segment will be verified standalone. The integrity check for each segment will focus on the installation and configuration of the hardware, when applicable, and software for that segment. A high-level overview of these integrity checks is presented in the appropriate sections below. A more detailed summary of these integrity checks is provided in Appendix C.

5.1.1 SPSR Server

5.1.1.1 Hardware

A second SPSR server will be added to the test configuration. This second server will be identical to the first and will be configured to be completely redundant to the other. The complete redundancy makes the identification of the prime server, with the exception of the NSM, transparent to the other NCC segments. The NSM must distinguish between the two to provide accurate network configuration information and to manually include or remove one from the NCCDS configuration.

5.1.1.2 Software

The SPSR contents for Build ”C” will complete the implementation of the Database Subsystem, the Scheduling Subsystem, the Input Subsystem, the Output Subsystem, the Acquisition Data Subsystem, and the Utility Subsystem. The SPSR software will again be developed in the Software Development Environment (SDE) in GSFC Building 13, Room 213. The software will be placed under CM control, merged with the Build B baseline, including problem report resolutions, and compiled as a single baseline. This single baseline will be propagated to the SPSR servers in the DT&T.

The Scheduling Subsystem will support Alternate SARs, Replace Requests, Wait List Requests, and operator-generated Freeze Requests in this build. The Scheduling Subsystem will also support the generation and transferring of TUT information for the web server. For batch scheduling, conflict resolution and schedule evaluation will also be supported. For managing the active schedule, the Scheduling Subsystem will also support Wait List processing.

The Input Subsystem will be enhanced to provide the services necessary to receive, validate, and store messages from the GTs. Specifically, these messages include SHO Status messages, SLRs, GAMs, and OPM Status messages (03/62) in response to Cancel SHO requests.

The Output Subsystem will be capable of sending GAMs and the full gamut of scheduling messages, for all possible transmission modes. The scheduling messages include SHOs, IFL SHOs, fixed USMs, flexible USMs, NES messages, as well as Cancel SHO requests, and NEC messages. The initial activation transmission mode will be enhanced from the Build B implementation to include additional messages, including delete notification messages for reprocessed events that were not part of the activated schedule. In addition to the initial activation mode, the Output subsystem will support Manual Mode, Automatic Mode, and Semi-Automatic mode transmissions. The Output Subsystem will be capable of specifying the types of messages to be sent through operator-defined transmission rule sets (TRSs). The progress of the schedule message transmissions can be monitored through the Schedule Transmission Progress display.

The Acquisition Data Subsystem will be augmented to support the transmission and reception of all acquisition data messages. Acquisition data (i.e., vectors) can be received by the SPSR through either secure FTP or formatted messages. The acquisition data messages that can be transmitted include vectors, maneuver sequences, and delta-t messages. The messages that can be received include State Vector Rejection OPM, Delta-T Adjustment Rejection OPM, and the Real-Time Mode OPM. For the transmission of acquisition messages, the Acquisition Data Subsystem will also support, in addition to the manual mode, the semi-automatic mode and throughput mode for vector transmission to the ground terminals. Like the transmission of schedule messages, both of these modes are defined through an operator-defined transmission rule set (TRS). The progress of the vector transmissions can be monitored through the Vector Transmission Progress display. Finally, the Acquisition Data Subsystem will also support vector editing and vector auditing in this build.

The Utility Subsystem will be enhanced to support the automatic failover between the redundant application and database servers. This feature is primarily implemented through a COTS product, HP ServiceGuard.

5.1.1.3 Database

It is anticipated that the database will undergo only minor changes for Build ”C”. These changes include further defining the interface between the database and the Scheduling and Output Subsystems, further database tuning analysis, the capability to manually purge the database based on the operator-defined retention criteria, and the necessary adjustments to provide for automatic switchovers between the redundant servers and planned failovers to emergency facilities. In addition, the database will include any changes or procedures necessary to support the controlling of database backups via the NSM.

5.1.1.4 Verification

The verification of the hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture. This verification will be performed prior to the installation of any SPSR application software on the redundant server.

The verification of the software installation and configuration for SPSR will be realized through CM reports and exercising the SPSR system. This exercising will consist of booting the servers and starting the SPSR application software. The Integration Team will verify that the startup script starts the necessary processes. This verification will also include the interface between the

redundant server and any peripherals, such as a printer, console, or tape drive. The activities related to the SPSR installation and configuration are listed in Section C.1.1.

The verification of the database will be done through DB reports and through exercising the system. This exercising will consist of executing the database backup and recovery processes. The activities related to the SPSR installation and configuration are listed in Section C.1.1.

5.1.2 Operator Workstation

5.1.2.1 Hardware

Additional operator workstations will be added to the DT&T facility. These operator workstations will located in the third test berth in GSFC Building 13, Room 262. This is the only change planned with respect to operator workstation hardware.

5.1.2.2 Software

The SPSR portion of the UI Subsystem will be enhanced to include all NCCDS 98 windows. Windows to be introduced in Build ”C” are those windows necessary to control and monitor schedule dissemination, manage acquisition data, control and monitor acquisition data dissemination, view SLR information, evaluate batch scheduling and facilitate conflict resolution, and generate TUT information. The UI to send and receive GAMs will be provided through a COTS e-mail package.

For Build ”C”, the CCS portion of the UI subsystem will be enhanced to include all windows necessary to monitor and control the new TDRS HIJ service types. Specifically, these windows provide the capability to view ODM data associated with and to reconfigure HIJ services.

5.1.2.3 Verification

The verification of the additional hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture. This verification will be performed prior to the installation of any GUI application software.

The verification of the software installation and configuration for the operator workstations will be realized through CM reports and exercising the operator workstation system. This exercising will consist of booting the operator workstations, starting the application software, logging on to the workstation and accessing a new window or icon. The Integration Team will verify that the startup script starts all necessary processes. This verification will also include the interface between the workstation and any peripherals, such as a printer, monitor, and/or tape drive. The activities related to the operator workstation installation and configuration are listed in Section C.1.2.

5.1.3 CCS

5.1.3.1 Hardware

For Build ”C”, there are no changes planned for the CCS hardware. However, for Build ”C”, CCS 3 will be included in the DT&T NCCDS 98 configuration.

5.1.3.2 Software

For Build "C", there is only one significant change to the CCS software planned. The CCS software will be modified to support the monitoring and control of the new TDRS HIJ service types. The modifications to support TDRS HIJ services include changes to the Event Sequencing to increase table sizes in order to set up Event Monitor support of the new services, changes to Event Monitor to process reconfiguration messages for the new service types and correctly format the Reconfiguration OPM, and changes to Network Monitor to process, store, and display larger ODM messages and correctly format customer UPD.

5.1.3.3 Verification

The verification of the CCS hardware will not be required as this hardware has not been modified or moved for NCCDS 98.

The verification of the software installation and configuration for each CCS will be realized through CM reports and exercising the CCS system. This exercising will consist of booting each CCS and starting the application software. The Integration Team will verify that the startup script starts the necessary processes. The activities related to the CCS installation and configuration are listed in Section C.1.3.

5.1.4 NPG

5.1.4.1 Hardware

The "Final" NPG will be installed on a Sun Ultra 1/170 workstation. This workstation contains a Superscalar UltraSPARC CPU and operates at 341 message instructions per second (MIPS). This workstation is equipped with 256-MB RAM and a 2.1-GB SCSI-2 disk. The final NCCDS 98 configuration will have a prime and redundant NPG to ensure reliable communications with and constant support to all external entities.

The Sun workstation will run the Solaris 2.5 operating system. This operating system supports both Posix-compliant threads and Solaris threads. The Solaris threads provide kernel support which can be used to optimize the NPG's real-time performance. The workstation will also include system level COTS software that provides an SNMP agent, a journaled file system, and failover capabilities.

5.1.4.2 Software

Software for the "Final" NPG will perform many of the same functions as the software for the Interim NPG. The software is still required to establish TCP/IP service connections with the SPSR to provide communications between the SPSR and 4800BB-based external customers. The NPG will also provide protocol conversion services for communications between TCP/IP MOCs and the CCS. For its interface with the CCS, the NPG will use UDP-encapsulated 4800BB (without RTP).

The NPG also retains the role of the NFE controller. This control includes initialization at start up, assigning the appropriate ports, exchanging life-test messages, and receiving error messages under certain conditions. Both the CCS and the SPSR will communicate with the GTs via the NPG and NFE. Therefore, the NPG must also implement failover logic for both the NFE and for

the NFE ports to ensure reliable communications with the ground terminal. The NPG and NFEs will communicate using the existing FEL protocol, which encapsulates 4800BB into TCP/IP streams. In turn, the NFEs will still communicate with external entities in pure 4800BB protocol.

The NPG will also provide Kerberos server services for those TCP/IP MOCs that wish to use Kerberos for I&A. These server services include credential exchange and message seal and unseal functions, including encryption and decryption. For Kerberised MOCs, the User ID and Password fields of the formatted messages are spare. Therefore, in order to ensure that real-time services provided by CCS are available to Kerberised MOCs, the NPG will supply the UDP-encapsulated 4800BB with the applicable User ID and Password, along with a corresponding Nascom site code.

For communications with legacy systems and the CCS, the NPG's software will include a full-implementation of the current Nascom 4800BB protocol, albeit encapsulated in UDP datagrams. This implies that the NPG will be able to send and receive CTMs, ACKs, multiblock messages, and retransmitted messages. For communications between a 4800BB endpoint and a TCP/IP endpoint, the NPG will associate ACKs with established service connections. For example, the failure of the 4800BB end point to acknowledge the third transmission of a message will cause the NPG to abort the TCP/IP service connections with the opposing endpoint.

5.1.4.3 The "NTS" NPG

In order to simulate TCP/IP MOCs, both Kerberised and non-Kerberised, a second NPG is required for the test architecture. This NPG, hereafter referred to as the NTS NPG, will be configured between the NTS SCD and the Firewall. In this configuration, the NTS NPG can be used to communicate over TCP/IP service connections established outside of the Firewall. The NTS NPG will be capable of initiating the TCP/IP service connections with either (both) the SPSR and the "NCC" NPG. In order to simulate Kerberised MOCs, the NTS NPG will have all the necessary Kerberos clients for credential exchange and encryption.

The "NTS" NPG will also be equipped with a web browser for verifying the access to the TUT information resident on the web server. The NTS NPG will also use the web browser to simulate the Nascom Operations Center (NOC). In this role, the NTS NPG will be used to verify that Nascom, and only Nascom, can access the Nascom Schedule Information which is also resident on the web server.

5.1.4.4 Verification

The verification of the hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture.

The verification of the software installation and configuration for the NPG will be realized through CM reports and exercising the Final NPG system. This exercising will consist of booting the NPG workstation, starting the application software, and logging on to the NPG. The Integration Team will verify that the startup script starts all necessary processes. This verification will also include the interface between the NPG workstation and any peripherals, such as a printer, monitor, and/or tape drive. The activities related to the NPG installation and configuration are listed in Section C.1.4.

The verification of the software installation and configuration of the NTS NPG will be achieved during the verification of the interfaces that it is required to support.

5.1.5 NSM

5.1.5.1 Hardware

For NCCDS 98, a second NSM J-class server will be added to the configuration. This second server will be identical to the first and will be configured to be completely redundant to the other. The complete redundancy provides the capability to simulate NSM failures to verify that the NSM is capable of switching from the prime server to the backup server. This failover will be completely transparent to the other nodes of the NCCDS.

5.1.5.2 Software

The NSM will consist of mostly COTS tools that are integrated to perform the system management functions for the NCCDS. For Build "C", the following COTS products are integrated with those delivered in the NSM Build A/B baseline:

- Remedy ARS - the primary mechanism for providing an automated trouble ticket system. This product integrates with HP IT/O and Oracle to identify network problems, record the necessary information, and alert the appropriate support personnel. The trouble ticket information can then be tracked until closure and retained for history reporting.
- Spider - a robust WEB-to-database interface application that provides a Common Gateway Interface (CGI) between an SQL form and the Oracle database. This tool is to provide the capability to build and maintain NCCDS configuration files through an HTML browser.
- Oracle - the RDBMS for storing trouble ticket information and configuration information.
- Netscape - the HTML browser used for viewing, creating, and maintaining NCCDS configuration files. This product will be integrated with Spider to provide the user interface for maintaining NCCDS configuration files and viewing trouble tickets.
- HP OmniBack II - the centralized installation, administration, and monitoring for all backup tasks and allows for an enterprise-wide, centrally managed, and policy driven backup strategy.

In addition to the COTS products, the NSM will also require scripts that provide remote startup capability for the SPSR, the NPG, the Firewall, and the operator workstations. The NSM will also be used to create and maintain the various tables and configuration information for the NCCDS, including the NCC Domain Name Server (DNS), the NCCDS Network Information Service (NIS), the NCCDS configuration files, and the mapping of SNMP IDs to devices IDs.

The COTS products, the remote startup scripts, and the various tables and files will be integrated into a single baseline and propagated to the DT&T. This propagation also includes any required installation of SNMP agents on each managed node for the collection of status and performance information.

5.1.5.3 Verification

The verification of the hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture. This verification will be performed prior to the installation of any NSM application software.

The verification of the software installation and configuration for the NSM server and workstation will be realized through CM reports and exercising the workstation system. This exercising will consist of booting the server and the workstation and starting the application software. The Integration Team will verify that the startup script starts the necessary processes. This verification will also include the interface between the server and any peripherals, such as a printer, console, or tape drive. The activities related to the NSM installation and configuration are listed in Section C.1.5.

5.1.6 Firewall

5.1.6.1 Hardware

The hardware platform for the NCC Firewall will be a SUN Ultra 140 (143MHz UltraSPARC). This workstation is equipped with 64-MB RAM and a 2.1-GB SCSI-2 drive. This workstation will also be equipped with a Quad Ethernet card to support the NCCDS network and up to three subnets (also referred to as a “DMZ”).

The Sun workstation will run the Solaris 2.5 operating system.

NOTE

Additional information for the Firewall is To Be Supplied [TBS].

5.1.6.2 Software

The Firewall software will be Checkpoint's Firewall-1, version 2.1c. This software supports the definition and execution of rule sets. These rule sets control the access to the internal NCCDS network as well as determine the Firewall’s reaction to specific events or classes of events.

5.1.6.3 Verification

The verification of the hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture. This verification will be performed prior to the installation of any Firewall application software.

The verification of the software installation and configuration for the Firewall will be realized through CM reports and exercising the system. This exercising will consist of booting the Firewall and starting the application software. The Integration Team will verify that the startup script starts the necessary processes. This verification will also include the interface between the server and any peripherals, such as a printer, console, or tape drive. The activities related to the Firewall installation and configuration are listed in Section C.1.6.

5.1.7 NCD

5.1.7.1 Hardware

The hardware platform for the NCD will be an HP workstation.

The NCD will run a current version of the HP-UX operating system, currently HP-UX 10.20.

NOTE

Additional information for the NCD is To Be Supplied [TBS].

5.1.7.2 Software

The NCD software is being developed in C and UNIX. The software will be capable of reading log files on the SPSR , CCS, and the NPG. The software will be capable of performing the filtering and data reduction necessary to present the operator with a desired subset of the logged information. For example, the NCD would be capable of providing the operator with a report of the SARs and GCMRs received by the NCC from Johnson Spaceflight Center during a specified time period.

5.1.7.3 Verification

The verification of the hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture. This verification will be performed prior to the installation of any NCD application software.

The verification of the software installation and configuration for the NCD will be realized through CM reports and exercising the system. This exercising will consist of booting the NCD and starting the application software. The Integration Team will verify that the startup script starts the necessary processes. This verification will also include the interface between the server and any peripherals, such as a printer, console, or tape drive. The activities related to the NCD installation and configuration are listed in Section C.1.7.

5.1.8 KDC

5.1.8.1 Hardware

The KDC will be an HP C-class server (C100) with 64MB of memory. The KDC will have a 2 GB system disk. This server will be connected to a private subnet of the Firewall.

The KDC will run a current version of the HP-UX operating system, currently HP-UX 10.20.

NOTE

Additional information for the KDC is To Be Supplied [TBS].

5.1.8.2 Software

The software for the KDC will be based on the MIT freeware, Kerberos 5 Release 1. Currently, use of the OpenVision implementation is being considered, but only if their system is fully

compatible with Kerberos 5 Release 1. This choice will be made at a later time based on cost and anticipated service support needs.

5.1.8.3 Verification

The verification of the hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture. This verification will be performed prior to the installation of any KDC application software.

The verification of the software installation and configuration for the KDC will be realized through CM reports and exercising the system. This exercising will consist of booting the KDC and starting the application software. The Integration Team will verify that the startup script starts the necessary processes. This verification will also include the interface between the server and any peripherals, such as a printer, console, or tape drive. The activities related to the KDC installation and configuration are listed in Section C.1.8.

5.1.9 Web Server

5.1.9.1 Hardware

The Web Server will run on an Intel x86 platform.

The Web Server will run on the Windows NT 4.0 operating system.

NOTE

Additional information for the Web Server is To Be Supplied [TBS].

5.1.9.2 Software

The Web Server will provide external entities and internal NCC operators with access to TUT information via a standard web browser (human-readable). The Web Server will also provide the NOC with exclusive access to Nascom Schedule Information. This information is used by Nascom for monitoring the IONET and to facilitate troubleshooting activities.

The Web Server will consist of COTS products and custom software. The COTS products will provide conversion of data into an HTML web page. The COTS software will also supply the file transfer protocol needed to get information from the SPSR database to the Web Server. The custom software is required for parsing the data extracted from the SPSR database into that data which is necessary to format the NES Schedule Information page. Custom software is also necessary to accept filtering parameters from the customer or Nascom and return the applicable data requested.

The COTS products may include some of the following:

- Oracle WebServer
- Powerbuilder 5.0
- Microsoft Internet Information Server
- Perl 5.0 for NT

- Microsoft SQL Server 6.5

NOTE

COTS information for the Web Server is To Be Supplied [TBS].

NOTE

The provision of the Nascom Schedule information page is still an open issue.

5.1.9.3 Verification

The verification of the hardware will be allocated to the NCC technicians responsible for establishing the NCCDS 98 physical architecture. This verification will be performed prior to the installation of any Web Server application software.

The verification of the software installation and configuration for the Web Server will be realized through CM reports and exercising the system. This exercising will consist of booting the Web Server and starting the application software. The Integration Team will verify that the startup script starts the necessary processes. This verification will also include the interface between the server and any peripherals, such as a printer, console, or tape drive. The activities related to the Web Server installation and configuration are listed in Section C.1.9.

5.2 NCCDS 98 Build "C" Interfaces

Once the integrity checks for each segment are completed satisfactorily, the interfaces between the segments will be verified. These interfaces will be verified in the order presented below so as to build the NCCDS 98 Build "C" configuration from the ground up. Therefore, the interfaces presented prior to the specific interface being verified are assumed to be satisfactorily integrated.

5.2.1 SPSR <==> Operator Workstation Interface

Changes to the SPSR <==> Operator Workstation interface are relatively minor. These changes are the introduction of new windows for evaluating batch schedules, facilitating conflict resolution, editing and auditing acquisition data, and the transmission of schedule and acquisition data messages. In addition, some of these new windows provide the capability to initiate new processes, such as generating TUT information, on the SPSR server.

For Build "C" system integration activities, Section C.2.1 describes the pieces of the SPSR<==>Operator Workstation interface that will be verified; what demonstrable event will be used to verify each piece, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, System Administration, and a JISTT representative.

5.2.2 NPG <==> NFE Interface

The interface between the NPG and the NFE (NCC) is similar to the interface between the INPG and the NFE. The NPG retains the responsibility of configuring and monitoring the NFEs within the NCCDS network. The MSS port (port 11) on the NFE is no longer required with this build. The Final NPG is also required to initiate the failover from one port or NFE to another during a component failure. Furthermore, the hardware and software of the "final" NPG is completely different from the INPG. Therefore, this interface will be reexamined during the Build "C" integration phase.

This interface will be verified through initialization and configuration of the NFEs and the monitoring the status of the individual NFE ports. This interface will be fully exercised through the exchange of electronic messages between the NCCDS and the GTs and "secure" MOCs. For this interface, the NPG and the NFE will exchange messages using the existing FEL protocol currently used between CCS and the NFE.

For Build "C" system integration activities, Section C.2.3 describes the pieces of the NPG<==>NFE interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, NPG Development, System Administration, and a JISTT representative.

5.2.3 SPSR <==> NPG Interface

The interface between the SPSR and the NPG is functionally the same as the Build B SPSR<==>INPG interface. However, the Build "C" interface has new hardware (the Final NPG) and supports a larger number of messages. For the SPSR, this build introduces the acquisition data status messages, the schedule messages required to support STGT, WSGTU, and SDPF, as well as SLRs and GAMs. As a proxy client for the GTs, the NPG must continue to generate the new Vector Request (VR) message to establish the acquisition dissemination service connection. As the proxy client for 4800BB MOCs, the NPG must continue to generate the SRR message to establish the schedule status service connection.

For Build "C" system integration activities, Section C.2.2 describes the pieces of the SPSR<==>NPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. This set of activities assumes that the NPG<==>SCD<==>NTS interface has been verified through activities related to the Nascom IP transition. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, NPG Development, System Administration, and a JISTT representative.

5.2.4 CCS <==> Operator Workstation Interface

Changes to the CCS<==> Operator Workstation interface are relatively minor. These changes are limited to the introduction of new windows for monitoring new TDRS HIJ services.

For Build "C" system integration activities, Section C.2.4 describes the pieces of the CCS<==>Operator Workstation interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The

following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, CCS Development, System Administration, and a JISTT representative.

5.2.5 CCS <==> NPG Interface

Functionally, the interface between the CCS and the NPG will be the same as the interface between the CCS and the INPG in the previous builds. The NPG will still be a "hop" for all communications between the CCS and any external entity. The CCS still performs all actions, such as ACKs and retransmissions, required to support Nascom 4800BB protocol. However, the hardware and software of the "final" NPG is completely different from the INPG. Therefore, this interface will be reexamined during the Build "C" integration phase.

For Build "C" system integration activities, Section C.2.5 describes the pieces of the CCS<==>NPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, CCS Development, NPG Development, System Administration, and a JISTT representative.

5.2.6 SPSR <==> CCS Interface

There are no major changes to the SPSR <==> CCS interface planned for Build "C". However, with the complete implementation of the Output subsystems, the trigger signaling the need to transfer active schedule information will not be simulated as it was in Build B. In addition, the CCS will also access service parameters and event information related to new TDRS HIJ service types. Therefore, this interface will be reexamined during the Build "C" integration phase.

For Build "C" system integration activities, Section C.2.6 describes the pieces of the SPSR <==> CCS interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, CCS Development, System Administration, and a JISTT representative.

5.2.7 SPSR/CCS <==> NPG interface

The interface between the SPSR, CCS, and the NPG is a combination of the interfaces described in the previous sections. The interface verification activities presented here are to verify that the NPG can handle concurrent message traffic with the SPSR and CCS. While this processing is functionally the same as that presented above, these activities will verify two unique features. First, the ability of the NPG to route certain messages, like SLRs and SHO Status OPMs, to multiple entities within the NCCDS will be verified. Second, these activities will verify that the NPG can handle multiblock messages flowing in both directions while maintaining message integrity and satisfying each communications protocol.

For Build "C" system integration activities, Section C.2.7 describes the pieces of the SPSR/CCS<==>NPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following

group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, CCS Development, NPG Development, System Administration, and a JISTT representative.

5.2.8 SPSR <==> NTS NPG Interface

The testing of NCCDS 98 Build "C" requires the ability to simulate TCP/IP MOCs. The basis of this simulation will be a second NPG, known as the NTS NPG, that will interface with the SPSR from "outside" the NCCDS 98 perimeter. The interface between the SPSR and the NTS NPG is almost identical to the SPSR <==> NPG interface described in a previous section. One exception is the NTS NPG's ability to behave as a Kerberised MOC; however, Kerberised services will be verified in later activities. The SPSR <==> NTS NPG interface will be used to verify the integration of the Firewall and the KDC server, as well as the Kerberos implementation for the SPSR.

For Build "C" system integration activities, Section C.2.8 describes the pieces of the SPSR <==> NTS NPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, NPG Development, System Administration, and a JISTT representative.

5.2.9 NPG <==> NTS NPG Interface

As stated in the previous section, the testing of NCCDS 98 Build "C" requires a second NPG, known as the NTS NPG, to simulate TCP/IP MOCs. The interface between the NPG and the NTS NPG simulates a TCP/IP MOC requesting real-time services from CCS. The activities of this section will verify the "open" (i.e., non-Kerberised) service connections; Kerberised services will be verified in later activities. The NPG <==> NTS NPG interface will be used to verify the integration of the Firewall and the KDC server, as well as the Kerberos implementation on the "NCC" NPG.

For Build "C" system integration activities, Section C.2.9 describes the pieces of the NPG <==> NTS NPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, NPG Development, System Administration, and a JISTT representative.

5.2.10 NTS NPG<==>KDC Interface

The testing of NCCDS 98 Build "C" requires the ability to simulate TCP/IP MOCs that use Kerberos for client I&A. The basis of this simulation will be the NTS NPG, which has the necessary Kerberos clients to exchange credentials, to provide data integrity assurance (i.e., encrypted hash value), and to provide data confidentiality (i.e., encrypted message). The Kerberos KDC is located on a separate subnet (i.e., in the "DMZ") of the Firewall (the integration of the Firewall is verified in later activities) and is accessed by the NTS NPG when establishing Kerberised service connections. The NTS NPG <==> KDC interface will be used to

verify the integration of the KDC server and the Kerberos implementation for the SPSR (and the Kerberos client on the NTS NPG).

The NPG has a Kerberos implementation similar to that on the SPSR. The NPG acts as a proxy server for the CCS in order to provide Kerberised real-time services. The Kerberos KDC is accessed by the NTS NPG when using Kerberised service connections for real-time services. The NTS NPG <==> KDC interface will be used to verify the integration of the KDC server and the Kerberos (server) implementation for the NPG.

For Build "C" system integration activities, Section C.2.10 describes the pieces of the NTS NPG <==> KDC interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, KDC Development (Security personnel), NPG Development, System Administration, and a JISTT representative.

5.2.11 SPSR<==>Web Server<==>NTS NPG Interface

The Web Server will provide customers with a Web browser interface to TUT information. The Web Server interfaces with the SPSR database in order to receive TUT information generated by SPSR [TBD]. It will also provide Nascom with a Web browser interface to the Nascom schedule information. The Web Server will be capable of receiving the suite of Nascom messages (NES, NESU, NEC) and constructing a Nascom schedule web page from them **[TBD]**. This web page is only viewable by Nascom Operations Center (NOC) personnel. The NTS NPG will provide the Web browser interface to the information on the Web server.

For Build "C" system integration activities, Section C.2.12 describes the pieces of the SPSR <==> Web Server <==> NTS NPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, Web Server Development, System Administration, and a JISTT representative.

5.2.12 Firewall Integration

For nominal operations, the Firewall is transparent to other NCCDS 98 entities; only the NSM has a direct interface with the Firewall for the exchange of configuration information and status monitoring. However, proper configuration of the Firewall is vital for protecting the NCCDS without denying services to authorized users.

For Build "C" system integration activities, Section C.2.13 describes the pieces of the Firewall integration that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The activities specified in this section verifies that the Firewall can be integrated into the NCCDS 98 environment and remain transparent to the other network entities. The interface between the Firewall and the NSM will be verified through activities defined in a later section. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, Firewall Development (Security personnel), System Administration, and a JISTT representative.

5.2.13 NSM<==>SPSR Interface

The NCCDS 98 Build "C" interface between the NSM and the SPSR will provide database monitoring, database backups, and database performance statistics. The NSM will also supply configuration information to the SPSR and allow remote startup of the SPSR applications. The NSM will also provide the capability to switch operational control from one SPSR server to its backup. The NSM will also continue to monitor the stability of specific SPSR processes, perform status polling on the SPSR server, and gather system statistics through intelligent agents resident on the SPSR system.

NOTE

The ability of the NSM to switch operational control from one SPSR server to the other is dependent upon the ability to integrate the SPSR failover software product with the NSM.

For Build "C" system integration activities, Section C.2.13 describes the pieces of the NSM<==>SPSR interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, NSM Development, System Administration, and a JISTT representative.

5.2.14 NSM<==>Operator Workstation Interface

The interface between the NSM and the operator workstations will be enhanced to allow remote startup of the operator workstation application software. The NSM will also be able to control backup and recovery of the software installed on the operator workstations.

For Build "C" system integration activities, Section C.2.14 describes the pieces of the NSM<==>Operator workstation interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, SPSR Development, CCS Development, NSM Development, System Administration, and a JISTT representative.

5.2.15 NSM<==>CCS Interface

The interface between the NSM and the CCS is not planned to change for NCCDS 98 Build "C". The NSM will continue to perform status polling on the CCS and gather system statistics through an SNMP agent provided by the CCS system. This interface will be regression tested to ensure that other changes have not negatively impacted the ability of NSM to gather system statistics from CCS.

For Build "C" system integration activities, Section C.2.15 describes the pieces of the NSM<==>CCS interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, CCS Development, NSM Development, System Administration, and a JISTT representative.

5.2.16 NSM<==>NPG Interface

The interface between the NSM and the Final NPG will support the downloading of endpoint definition tables and other configuration files from the NSM to the NPG. This interface will also support status polling on the NPG and gather system statistics through intelligent agents resident on the NPG system. The NSM will also provide the capability to manually switch operational control from one NPG (the prime one) to its backup.

NOTE

The ability of the NSM to switch operational control from one NPG to the other is dependent upon the ability to integrate the NPG failover software product with the NSM.

For Build "C" system integration activities, Section C.2.16 describes the pieces of the NSM<==>NPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, NPG Development, NSM Development, System Administration, and a JISTT representative.

5.2.17 NSM<==>Firewall Interface

The interface between the NSM and the Firewall will provide the capability to configure the Firewall, perform status polling, and gather system statistics through intelligent agents resident on the Firewall system. The NSM will also provide the capability to manually switch operational control from one Firewall (the prime one) to its backup.

NOTE

The ability of the NSM to switch operational control from one Firewall to the other is dependent upon the products and procedures identified for the Firewall.

For Build "C" system integration activities, Section C.2.17 describes the pieces of the NSM<==>Firewall interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, Firewall Development (Security personnel), NSM Development, System Administration, and a JISTT representative.

5.2.18 NCD<==>CCS Interface

The NCCDS 98 Build "C" interface between the NCD and the CCS will provide the delogging capability for log files resident on the CCS system. The NCD will be capable of extracting information from the CCS log files resident on the CCS disk or those archived to tape. This data includes formatted blocks received and processed by the CCS, certain process status information, and operator alerts generated by CCS application software. The NCD will read the logged data needed from the CCS. The NCD will then perform all necessary filtering and data reduction. This processing will also include interleaving with logged data from other sources as necessary.

For Build "C" system integration activities, Section C.2.18 describes the pieces of the NCD<==>CCS interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, NCD Development, CCS Development, System Administration, and a JISTT representative.

5.2.19 NCD<==>SPSR Interface

The NCCDS 98 Build "C" interface between the NCD and the SPSR will provide the delogging capability for log files resident on the SPSR system. The NCD will be capable of extracting information from the SPSR log file resident on the SPSR server. This data includes formatted TCP messages received and processed by the SPSR, certain process status information, and operator alerts generated by SPSR application software. The NCD will read the logged data needed from the SPSR. The NCD will then perform all necessary filtering and data reduction. This processing will also include interleaving with logged data from other sources as necessary.

For Build "C" system integration activities, Section C.2.19 describes the pieces of the NCD<==>SPSR interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, NCD Development, SPSR Development, System Administration, and a JISTT representative.

5.2.20 NCD<==>NPG Interface

The NCCDS 98 Build "C" interface between the NCD and the NPG will provide the delogging capability for log files resident on the NPG system. The NCD will be capable of extracting information from the NPG log file resident on the NPG workstation. This data includes formatted TCP messages and UDP datagrams received and processed by the NPG as well as certain process status information. The NCD will read the logged data needed from the NPG. The NCD will then perform all necessary filtering and data reduction. This processing will also include interleaving with logged data from other sources as necessary.

For Build "C" system integration activities, Section C.2.20 describes the pieces of the NCD<==>NPG interface that will be verified; what demonstrable event will be used to verify it, including the expected results; and any dependencies on other events. The following group representatives of the Integration Team will be required to support the verification of this interface: Release Leader, NCD Development, NPG Development, System Administration, and a JISTT representative.

5.3 Switchover Scenarios

The NCCDS 98 architecture includes hardware and software redundancy to satisfy high Reliability, Maintainability, and Availability (RMA) requirements. These RMA requirements are driven by the critical support functions provided by the NCCDS to SN customers. These critical functions are those functions that have no feasible procedural backup, and whose failure would have immediate impact to SN customers or result in non-recoverable loss of data.

The purpose of the hardware and software redundancy is the allow for the timely recovery from the failure of a system component. In most cases, this recovery is the switchover, either manual or automatic, from a prime processor to a completely redundant backup. This switchover is aided by software that facilitate the starting of redundant processes and the recovery of necessary data.

For NCCDS 98, the SPSR, the CCS, the NPG, the Firewall, and the NFEs are each duplicated within the hardware and software architecture. With the exception of the CCS, the control over the NCCDS configuration, including the switchover process from a prime node to its backup, is provided by the NSM. This switchover process is usually initiated manually, but implemented through a COTS product that is integrated on each redundant node. The CCS retains its current switchover implementation which is manually initiated from the CCS operator console.

For the integration activities for NCCDS 98, the switchover processes for each redundant node will be exercised. Anomalies noted during the execution of the switchover procedures will be documented and resolved in accordance with the established problem report resolution procedure. However, the failure to resolve these anomalies will not preclude the transition of NCCDS 98 Build "C" to its Integration Test phase.

5.3.1 SPSR Switchover

[TBD]

5.3.2 CCS Switchover

[TBD]

5.3.3 NPG Switchover

[TBD]

5.3.4 NFE Switchover

[TBD]

5.3.5 Firewall Switchover

[TBD]

5.3.6 NSM Switchover

[TBD]

Appendix A. Build A Integration Activities

A.1 Build A Segment Verification Activities

The activities to be performed to verify that the individual segments are ready for integration are identified below. Each table corresponds to a segment being delivered for NCCDS 98 Build A.

A.1.1 SPSR Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A11-1	Interaction with operator keyboard/mouse.	Logon to server account using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
A11-2	Interaction with printer.	As above operator, print the contents of a text file.	Contents of text file are printed on default system printer.	Item A11-1 is completed successfully.
A11-3	Ability to load a database from tape. (interaction with tape drive)	From command line interface (?) load in database files from tape.	Populated database files are resident on SPSR server.	Item A11-1 is successful.
A11-4	Ability to modify database through SQL	From appropriately privileged account, modify an SPSR database table just loaded.	Applicable record is modified in the database.	Item A11-3 is successful.
A11-5	Ability to start SPSR application software.	Initiate execution of script (command line) that starts SPSR application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection of printed list of active processes).	Item A11-4 is successful.

A.1.2 Operator Workstation Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A12-1	Interaction with operator keyboard/mouse.	Logon to an operator account using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
A12-2	Interaction with printer.	As above operator, print the contents of the screen.	Contents of the screen are printed on default system printer.	Item A12-1 is completed successfully.
A12-3	Access to electronic mail.	Send an e-mail message to yourself.	Message is sent and received.	Item A12-1 is successful.
A12-4	Ability to start Operator Workstation application software.	Initiate execution of script (command line) that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item A12-2 is successful.

A.1.3 CCS Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A13-1	Interaction with operator keyboard.	Logon to a DBA account using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
A13-2	Interaction with printer.	As above operator, print the contents of the Site Table.	Contents of the table are printed on default system printer.	Item A13-1 is completed successfully.
A13-3	Interaction with tape drive.	Read a Static Save Tape using the Backup command procedure.	Tape is read containing the applicable .DAT files.	Item A13-1 is successful.
A13-4	Ability to start CCS application software.	Initiate execution of script (username) that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item A13-2 is successful.

A.1.4 INPG Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A14-1	Interaction with configuration utility.	From the designated workstation, establish the desired configuration file(s).	Configuration files are established on the INPG.	Hardware installation is successful.
A14-2	Ability to start INPG application software.	Power up (reboot?) INPG.	All necessary processes are started by application startup script (verified through inspection).	Item A14-1 is successful.
A14-3	View INPG status through monitor.	Once running, view the INPG monitor for status information.	Applicable information is displayed on the monitor.	Item A14-2 is successful.

A.1.5 NSM Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A15-1	Interaction with operator keyboard.	Logon to NSM using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
A15-2	Interaction with printer.	As above operator, print the contents of the DNS configuration table.	Contents of the table are printed on default system printer.	Item A15-1 is completed successfully.
A15-3	Ability to start NSM application software.	Initiate execution of script that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item A15-1 is successful.
A15-4	Interaction with tape drive.	Copy a file (the historical log file?) to tape.	Tape is created containing the applicable files.	Item A15-3 is successful.

A.2 Build A Interface Verification Activities

The activities to be performed to verify that the interfaces between the various segments are properly implemented are identified below. Each table corresponds to a particular interface being delivered as part of NCCDS 98 Build A.

A.2.1 SPSR <==> Operator Workstation Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A21-1	Logon verification, identification, and privileges	Logon to operator workstation as member of DB group and as member of SCHD group	Each operator receives a different toolbar. Correct usernames are displayed.	Segment verification for SPSR is complete
A21-2	Add object to the database	Navigate windows to add a MAR SSC for a SIC	Windows are displayed as expected; DB operator can add the object, SCHD cannot	Item A21-1 is successful
A21-3	Review object on the database	Navigate windows to review contents of SSC added above	Windows are displayed as expected; data is as added.	Item A21-2 is successful
A21-4	Initiate an application process	Generate an invalid SAR from the operator	Validation software in Input subsystem detects invalidity; alerts operator.	Item A21-1 is successful
A21-5	Receive and acknowledge action alerts	Alert specific to SCHD is generated, received by SCHD, and ACK'd	Alert dialog appears at SCHD not DB; Alert is ack'd; Review of all alerts displays it as ack'd.	Item A21-4 is successful
A21-6	Create action alert filter/sort	Operator specifies the TDRSs and/or SICs for which alerts are to be received.	Filter/sort can be created, named, stored, and retrieved.	Item A21-5 is successful
A21-7	Filter alerts on/off	Alert for a specific TDRS is generated Similar alert is generated again.	Alert dialog appears; Same alert is not received with filter on.	Item A21-6 is successful
A21-8	Final verification of SPSR<=>Operator Workstation interface	Execute INCC101-B1.6	As documented in the test procedure.	Above Items are successfully completed.

A.2.2 CCS <==> Operator Workstation Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A22-1	Logon verification, identification, and privileges	Logon to operator workstation as member of TNC group and as member of PA group	Each operator receives a different toolbar. Correct usernames are displayed.	Segment verification for CCS and workstations is complete
A22-2	Modify information in data files	Navigate windows to UPD Select window and select UPD for User/SUPIDEN combination	Windows are displayed as expected; PA operator can select UPD, TNC cannot	Item A22-1 is successful
A22-3	Review information in the CCS data files.	Navigate windows to review the UPD Select Summary window	Windows are displayed as expected; data retrieved is consistent with that modified.	Item A22-2 is successful
A22-4	Initiate an application process	Open several TDRS Support Summary windows on a workstation.	Windows open as expected. Information is updated every 5 seconds as events start and stop.	Item A22-1 is successful
A22-5	Use of CCS as time server.	Set the workstation's system time to be 2 minutes slow; then configure workstation and CCS on DevLAN.	CCS (at some interval?) broadcasts UTC on LAN. Workstation receives time and updates its system time accordingly.	Item A22-1 is successful.
A22-6	Final verification of CCS<==>Operator Workstation interface	Execute INCC101-B1.7	As documented in the test procedure.	Above Items are successfully completed.

A.2.3 SPSR <==> CCS Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A23-1	Access and exchange of SPSR data at CCS startup.	Run startup process for CCS (STARTCCS).	Necessary process are started. SPSR database is accessed and relevant information extracted. Information is formatted and written to CCS Data files.	Workstation interfaces verified successfully
A23-2	Operator-initiated transfer of SN data from SPSR to CCS	Logon to operator workstation as member of SYST group and navigate windows as needed; select option to update the CCS DQM data file	Windows are displayed as expected; the CCS data file are rebuilt (new) and contain the same data as the SPSR database.	Item A22-1 is successful.
A23-3	Automatic (trigger-initiated) exchange of event information	Navigate windows to add a new SIC to the database.	Windows are displayed as expected; Customer object added to database; trigger generated for table update	Item A22-1 is successful.
A23-4	Use of CCS as time server.	Set the SPSR server system time to be 2 minutes slow; then configure SPSR and CCS on DevLAN.	CCS (at some interval?) broadcasts UTC on LAN. SPSR queries time server, receives time, and updates its system time accordingly.	Item A23-3 is successful.
A23-5	Access to service parameter information when validating GCMRs.	From the operator workstation, generate a GCMR that has a parameter out of range with respect to the service parameters.	GCMR is recognized as invalid and not sent; operator is alerted.	Item A23-3 is successful.
A23-6	Final verification of SPSR<=>CCS interface	Execute INCC101-B1.8	As documented in the test procedure.	Above Items are successfully completed.

A.2.4 NSM <==> SPSR Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A24-1	Gathering of system statistics	Enter correct information to review the statistics being collected for SPSR.	Statistics are shown to the operator.	Segment verification for the SPSR and NSM is complete
A24-2	Final verification of NSM<=>SPSR interface	Execute INCC101-B1.9	As documented in the test procedure.	Above item is successfully completed.

A.2.5 NSM <==> Operator Workstation Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A25-1	Gathering of system statistics	Enter correct information to review the statistics being collected for operator workstation.	Statistics are shown to the operator.	Segment verification for the operator workstation and NSM is complete
A25-3	Final verification of NSM<=>Operator Workstation interface	Execute INCC101-B1.10	As documented in the test procedure.	Above item is successfully completed.

A.2.6 NSM <==> CCS Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A26-1	Gathering of system statistics	Enter correct information to review the statistics being collected for CCS.	Statistics are shown to the operator.	Segment verification for the CCS and NSM is complete
A26-2	Use of CCS as time server.	Set the SPSR server system time to be 2 minutes slow; then configure NSM and CCS on DevLAN.	CCS (at some interval?) broadcasts UTC on LAN. NSM queries time server, receives time, and updates its system time accordingly.	Item A26-1 is successful.
A26-3	Final verification of NSM<=>CCS interface	Execute INCC101-B1.11	As documented in the test procedure.	Above Items are successfully completed.

A.2.7 INPG <==> NFE Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A27-1	Configuring of the NFE	Reboot the NFE; Startup the INPG.	The NFE is configured with the expected port assignments and IP address.	NPG and NFE segment verification is successful
A27-2	Final verification of INPG<=>NFE interface	Execute INCC1nn-B2.12	As documented in the test procedure.	Above item is successfully completed.

A.2.8 CCS <==> INPG Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A27-1	Routing of inbound message to CCS	Transmit a UPD Request message (92/04) from the NTS.	The message is received by the CCS just as it was sent from the NTS; SPSR does not receive a message; retransmissions from the NTS do not occur.	CCS and INPG segment verification is successful
A27-2	ACK for CCS message (CTM) returned to CCS.	Transmit a CTM/CTB to a MOC.	The NTS receives the CTM and the corresponding ACK received by the CCS as it was sent from the NTS; retransmissions from the CCS do not occur	Item A27-1 is successful
A27-3	Processing multiblock message from CCS	Transmit multiblock UPD from the CCS.	The NTS receives the UPD successfully; retransmissions from the CCS do not occur	Item A27-2 is successful
A27-4	Final verification of CCS<=>INPG interface	Execute INCC101-B1.12	As documented in the test procedure.	Above Items are successfully completed.

A.2.9 SPSR <==> INPG Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A28-1	Establish service connections with SPSR	Power up the INPG	INPG sends CTM to NTS; upon successful ACK, INPG establishes all applicable service connections (including sending SRR) as defined in its configuration table.	SPSR and INPG segment verification is successful
A28-2	Routing of inbound message to SPSR	Transmit a TSW message (99/25) from the NTS.	INPG sends ACK to NTS; SPSR receives TSW message and stores information in database.	Item A28-1 is successful
A28-3	INPG consumes ACK for SPSR	Transmit an invalid SAR from a MOC.	The SPSR receives the SAR and the corresponding SRM is received by the NTS; the NTS generates an ACK for the SRM, which is consumed by the NPG.	Item A28-2 is successful
A28-4	INPG monitors ACK for SPSR	Disable ACKs for a site at the NTS; Transmit an invalid SAR from that site.	The SPSR receives the SAR and the corresponding SRM is received by the NTS 3 times; the INPG aborts the applicable service connections for that site (customer). INPG begins transmitting CTMs to reestablish communications.	Item A28-3 is successful
A28-5	Final verification of SPSR<=>INPG interface	Execute INCC101-B1.13	As documented in the test procedure.	Above Items are successfully completed.

A.2.10 SPSR/CCS <==> INPG Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
A29-1	Routing of concurrent messages and ACK's	Transmit multiblock UPD from the CCS; at the same time transmit SARs and GCMRs from the NTS.	SPSR, CCS, and NTS receive all messages successfully; retransmissions from the CCS, INPG, or NTS do not occur; NTS does not report multiblock message errors.	Items A27-1 through A28-4 are successful
A29-2	Nascom protocol support	Disable ACKs at the NTS. Transmit a Return Channel Time Delay (RCTD) message and a SAR at the same time.	RCTD message is retransmitted by the CCS; the SRM is retransmitted by the INPG. Site is downed and SPSR service connections are aborted.	Item A29-1 is successful.
A29-3	Final verification of SPSR/CCS<=>INPG interface	Execute INCC101-B1.14	As documented in the test procedure.	Above Items are successfully completed.

Appendix B. Build B Integration Activities

B.1 Build B Segment Verification Activities

The activities to be performed to verify that the individual segments are ready for integration are identified below. Each table corresponds to a segment being integrated for NCCDS 98 Build B.

B.1.1 SPSR Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
B11-1	Interaction with operator keyboard/mouse.	Logon to server account using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
B11-2	Interaction with printer.	As above operator, print the contents of a text file.	Contents of text file are printed on default system printer.	Item B11-1 is completed successfully.
B11-3	Ability to load a database from tape. (interaction with tape drive)	From command line interface (?) load in database files from tape.	Populated database files are resident on SPSR server.	Item B11-1 is successful.
B11-4	Ability to modify database through SQL	From appropriately privileged account, modify an SPSR database table just loaded.	Applicable record is modified in the database.	Item B11-3 is successful.
B11-5	Ability to start SPSR application software.	Initiate execution of script (command line) that starts SPSR application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection of printed list of active processes).	Item B11-4 is successful.

B.1.2 Operator Workstation Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
B12-1	Interaction with operator keyboard/mouse.	Logon to an operator account using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
B12-2	Interaction with printer.	As above operator, print the contents of the screen.	Contents of the screen are printed on default system printer.	Item B11-1 is completed successfully.
B12-3	Access to electronic mail.	Send an e-mail message to yourself.	Message is sent and received.	Item B12-1 is successful.
B12-4	Ability to start Operator Workstation application software.	Initiate execution of script (command line) that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item B12-2 is successful.

B.1.3 CCS Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
B13-1	Interaction with operator keyboard.	Logon to a DBA account using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
B13-2	Interaction with printer.	As above operator, print the contents of the Site Table.	Contents of the table are printed on default system printer.	Item B13-1 is completed successfully.
B13-3	Interaction with tape drive.	Create a Static Save Tape from the Backup command procedure.	Tape is created containing the applicable .DAT files.	Item B13-1 is successful.
B13-4	Ability to start CCS application software.	Initiate execution of script (username) that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item B13-2 is successful.

B.1.4 INPG Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
B14-1	Interaction with configuration utility.	From the designated workstation, establish the desired configuration file(s).	Configuration files are established on the INPG.	Hardware installation is successful.
B14-2	Ability to start INPG application software.	Power up (reboot?) INPG.	All necessary processes are started by application startup script (verified through inspection).	Item B14-1 is successful.

B.1.5 NSM Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
B15-1	Interaction with operator keyboard.	Logon to NSM using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
B15-2	Interaction with printer.	As above operator, print the contents of the DNS configuration table.	Contents of the table are printed on default system printer.	Item B15-1 is completed successfully.
B15-3	Ability to start NSM application software.	Initiate execution of script that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item B15-1 is successful.
B15-4	Interaction with tape drive.	Copy a file (the historical log file?) to tape.	Tape is created containing the applicable files.	Item B15-3 is successful.

B.2 Build B Interface Verification Activities

The activities to be performed to verify that the interfaces between the various segments are properly implemented are identified below. Each table corresponds to a particular interface being delivered as part of NCCDS 98 Build B.

B.2.1 SPSR <==> Operator Workstation Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
B21-1	Logon verification, identification, and privileges	Logon to operator workstation as member of DB group and as member of SCHD group	Each operator receives a different toolbar. Correct usernames are displayed.	Segment verification for SPSR is complete
B21-2	Add object to the database	Navigate windows to add an event to the active schedule.	Windows are displayed as expected; SCHD operator group can add the event, DB group cannot	Item B21-1 is successful
B21-3	Review object on the database	Navigate windows to review contents of the active schedule.	Windows are displayed as expected; data is accessible.	Item B21-2 is successful
B21-4	Initiate an application process	Generate a batch schedule.	Scheduling process is initiated from the GUI; control is returned to the operator once schedule generation has started.	Item B21-1 is successful
B21-5	Edit SARs resident on the database.	Access SARs resident on the database and edit them.	SARs are modified and stored on the database.	Item B21-1 is successful
B21-6	Final verification of SPSR<=>Operator Workstation interface	Execute INCC101-B1.6	As documented in the test procedure.	Above Items are successfully completed.

B.2.2 CCS <==> Operator Workstation Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
B22-1	Logon verification, identification, and privileges	Logon to operator workstation as member of TNC group and as member of PA group	Each operator receives a different toolbar. Correct usernames are displayed.	Segment verification for CCS and workstations is complete
B22-2	Modify information in data files	Navigate windows to select UPD for a customer.	Windows are displayed as expected; PA operator can select UPD, TNC cannot	Item B22-1 is successful
B22-3	Initiate an application process	Generate an invalid GCM from the TNC operator	Validation software detects invalidity; informs operator.	Item B22-1 is successful
B22-4	Final verification of CCS<==>Operator Workstation interface	Execute INCC101-B1.7	As documented in the test procedure.	Above Items are successfully completed.

B.2.3 SPSR <==> CCS Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
B23-1	Access and exchange of SPSR data (CCS Authorized Users) at CCS startup.	Run startup process for CCS (STARTCCS).	Necessary process are started. SPSR database is accessed and relevant information extracted. Information is formatted and written to CCS Data files.	Workstation interfaces verified successfully
B23-2	Operator-initiated transfer of event data from SPSR to CCS	Logon to operator workstation as member of SYST group and navigate windows as needed; select option to update CCS event data file	Windows are displayed as expected; CCS SN data file is rebuilt and contain the same data as the SPSR database.	Workstation interfaces verified successfully
B23-3	Automatic (trigger-initiated) exchange of event information	Navigate windows to add a schedule request applicable to the automatic scheduling phase (run script to simulate manual SHO transmission).	Windows are displayed as expected; Schedule request and event (SHO) object added to database; trigger generated for event update	Workstation interfaces verified successfully
B23-4	Operator access to CCS-generated alerts	Allow above event to go active in CCS; CCS generates start alert.	TNC operator receives the start alert; other operator groups do not.	Item B23-2 is successful
B23-5	Final verification of SPSR<=>CCS interface	Execute INCC101-B1.8	As documented in the test procedure.	Above Items are successfully completed.

B.2.4 NSM <==> SPSR Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
B24-1	Monitoring of SPSR processes.	Force a monitored process to abnormally terminate.	Notification of the terminated process is provided to the operator.	Segment verification for the SPSR and NSM is complete
B24-2	Final verification of NSM<=>SPSR interface	Execute INCC101-B1.9	As documented in the test procedure.	Above item is successfully completed.

B.2.5 NSM <==> Operator Workstation Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
B25-1	Monitoring of SPSR processes.	Force a monitored process to abnormally terminate.	Notification of the terminated process is provided to the operator.	Segment verification for the SPSR and NSM is complete
B25-2	Final verification of NSM<=>Operator Workstation interface	Execute INCC101-B1.10	As documented in the test procedure.	Above item is successfully completed.

B.2.6 SPSR <==> INPG Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
B26-1	Establish service connections with SPSR	Power up the INPG	INPG sends CTM to NTS; upon successful ACK, INPG establishes all applicable service connections as defined in its configuration table; This includes formatting and transmitting a VR for each ground terminal.	SPSR and INPG segment verification is successful
B26-2	Routing of inbound message to SPSR	Transmit a IIRV message (03/10) from the NTS (simulating FDF).	INPG sends ACK to NTS; SPSR receives IIRV message and stores information in database.	Item B26-1 is successful
B26-3	INPG consumes ACK for SPSR	Transmit an invalid SAR (based on scheduling ground rules) from a MOC.	The SPSR receives the SAR and the corresponding SRM is received by the NTS; the NTS generates an ACK for the SRM, which is consumed by the NPG.	Item B26-2 is successful
B26-4	INPG monitors ACK for SPSR	Disable ACKs for a site at the NTS; Transmit IIRVs to that site.	The IIRV message is received by the NTS 3 times; the INPG aborts the applicable service connections for that site. INPG begins transmitting CTMs to reestablish communications.	Item B26-3 is successful
B26-5	Final verification of SPSR<=>INPG interface	Execute INCC101-B1.13	As documented in the test procedure.	Above Items are successfully completed.

B.2.7 SPSR/CCS <==> INPG Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
B27-1	Routing of concurrent messages and ACK's	With UPD selected, transmit multiblock ODMs from the NTS; at the same time transmit SARs and GCMRs from the NTS.	SPSR, CCS, and NTS receive all messages successfully; retransmissions from the CCS, INPG , or NTS do not occur; NTS and CCS do not report multiblock message errors.	Item B26-4 is successful
B27-2	Nascom protocol support	Disable ACKs at the NTS. Transmit a Return Channel Time Delay (RCTD) message and a USM (by activating a schedule) at the same time.	RCTD message is retransmitted by the CCS; the USM is retransmitted by the INPG. Site is downed and SPSR service connections are aborted.	Item B27-1 is successful.
B27-3	Final verification of SPSR/CCS<=>INPG interface	Execute INCC101-B1.14	As documented in the test procedure.	Above Items are successfully completed.

Appendix C. Build C Integration Activities

C.1 Build C Segment Verification Activities

The activities to be performed to verify that the individual segments are ready for integration are identified below. Each table corresponds to a segment being delivered for NCCDS 98 Build C. Segments delivered in previous builds will be verified again during the integration activities for this build.

NOTE

The activities listed in this section are subject to change as a result of additional information and/or NCCDS 98 changes that are not foreseen at this time.

C.1.1 SPSR Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C11-1	Interaction with operator keyboard/mouse.	Logon to server account using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
C11-2	Interaction with printer.	As above operator, print the contents of a text file.	Contents of text file are printed on default system printer.	Item C11-1 is completed successfully.
C11-3	Ability to load a database from tape. (interaction with tape drive)	(From command line interface?) load in database files from tape.	Populated database files are resident on SPSR server.	Item C11-1 is successful.
C11-4	Ability to query the database using SQL	From appropriately privileged account, query an SPSR database table.	Applicable report is generated from the database.	Item C11-3 is successful.
C11-5	Ability to start SPSR application software.	Initiate execution of script that starts SPSR application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection of printed list of active processes).	Item C11-4 is successful.

C.1.2 Operator Workstation Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C12-1	Interaction with operator keyboard/mouse.	Logon to an operator account using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
C12-2	Interaction with printer.	As above operator, print the contents of the screen.	Contents of the screen are printed on default system printer.	Item C11-1 is completed successfully.
C12-3	Access to electronic mail.	Send an e-mail message to yourself.	Message is sent and received.	Item C12-1 is successful.
C12-4	Ability to start Operator Workstation application software.	Initiate execution of script (command line) that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item C12-2 is successful.

C.1.3 CCS Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C13-1	Interaction with operator keyboard.	Logon to a DBA account using the keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
C13-2	Interaction with printer.	As above operator, print the contents of the Site Table.	Contents of the table are printed on default system printer.	Item C13-1 is completed successfully.
C13-3	Interaction with tape drive.	Create a Static Save Tape from the Backup command procedure.	Tape is created containing the applicable .DAT files.	Item C13-1 is successful.
C13-4	Ability to start CCS application software.	Initiate execution of script (username) that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item C13-2 is successful.

C.1.4 NPG Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C14-1	Interaction with operator keyboard.	Logon to the NPG using the keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
C14-2	Interaction with printer.	As above operator, print the contents of endpoint definition table.	Contents of the table are printed on default system printer.	Item C14-1 is completed successfully.
C14-3	Interaction with tape drive.	Copy a file to tape for archival.	Tape is created containing the applicable file(s).	Item C14-1 is successful.
C14-4	Ability to start NPG application software.	Initiate execution of script (username) that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item C14-1 is successful.

C.1.5 NSM Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C15-1	Interaction with operator keyboard.	Logon to NSM using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
C15-2	Interaction with printer.	As above operator, print the contents of the NCCDS configuration table(s).	Contents of the table are printed on default system printer.	Item C15-1 is completed successfully.
C15-3	Ability to start NSM application software.	Initiate execution of script that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item C15-1 is successful.
C15-4	Interaction with database.	As above operator, submit a trouble ticket to the database.	Contents of the table are printed on default system printer.	Item C15-3 is completed successfully.
C15-5	Interaction with tape drive.	Copy a file (the historical log file?) to tape.	Tape is created containing the applicable files.	Item C15-4is successful.

C.1.6 NFW Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C16-1	Interaction with operator keyboard.	Logon to NFW using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
C16-2	Interaction with printer.	As above operator, print the contents of the some (configuration) table.	Contents of the table are printed on default system printer.	Item C16-1 is completed successfully.
C16-3	Ability to start NFW application software.	Initiate execution of script that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item C16-1 is successful.
C16-4	Interaction with tape drive.	Copy a file to tape.	Tape is created containing the applicable file(s).	Item C16-3 is successful.

C.1.7 NCD Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C17-1	Interaction with operator keyboard.	Logon to NCD using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
C17-2	Interaction with printer.	As above operator, print the contents of a file.	Contents of the table are printed on default system printer.	Item C17-1 is completed successfully.
C17-3	Ability to start NCD application software.	Initiate execution of script that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item C17-1 is successful.
C17-4	Interaction with tape drive.	Copy a (delog) file to tape.	Tape is created containing the applicable files.	Item C17-3 is successful.

C.1.8 KDC Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C18-1	Interaction with operator keyboard.	Logon to KDC using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
C18-2	Interaction with printer.	As above operator, print the contents of a file.	Contents of the file are printed on default system printer.	Item C18-1 is completed successfully.
C18-3	Ability to start KDC application software.	Initiate execution of script that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item C18-1 is successful.
C18-4	Interaction with tape drive.	Copy a file to tape.	Tape is created containing the applicable files.	Item C18-3 is successful.

C.1.9 Web Server Segment Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C19-1	Interaction with operator keyboard.	Logon to Web Server using keyboard.	Keyboard functional; operator logged on.	Hardware installation is successful.
C19-2	Interaction with printer.	As above operator, print the contents of some file.	Contents of the table are printed on default system printer.	Item C19-1 is completed successfully.
C19-3	Ability to start Web Server application software.	Initiate execution of script that starts application software (necessary processes).	All necessary processes are started by application startup script (verified through inspection).	Item C19-1 is successful.
C19-4	Interaction with tape drive.	Copy a file to tape.	Tape is created containing the applicable file.	Item C19-3 is successful.

C.2 Build C Interface Verification Activities

The activities to be performed to verify that the interfaces between the various segments are properly implemented are identified below. Each table corresponds to a particular interface being delivered as part of NCCDS 98 Build C. Interfaces defined in previous builds will be verified again during the integration activities for this build.

NOTE

The activities listed in this section are subject to change as a result of additional information and/or NCCDS 98 changes that are not foreseen at this time.

C.2.1 SPSR <==> Operator Workstation Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C21-1	Logon verification, identification, and privileges	Logon to operator workstation as member of DB group and as member of FCST group	Each operator receives a toolbar. Correct usernames are displayed.	Segment verification is complete
C21-2	Add a Replace Request to the database	Navigate windows to submit the Replace Request to the 'batch scheduling' period.	Windows are displayed as expected; FCST operator can add the Replace Request, DB cannot. The request is stored for batch scheduling.	Item C21-1 is successful
C21-3	Generate TUT information.	Navigate windows to select the parameters and generate TUT.	Windows are displayed as expected; TUT information is created and stored in the database; operator alerted at completion.	Item C21-1 is successful
C21-4	Move vectors to secondary storage.	Navigate windows to select the vector data to move to secondary storage.	Selected vectors are moved from primary storage to secondary storage; verify that they cannot be selected for transmission (?)	Item C21-1 is successful
C21-7	Create a Schedule Transmission Rule Set (STRS)	Navigate windows to create and activate a STRS.	STRS is identified as active	Item C21-1 is successful
C21-8	Purge the database.	Navigate windows to establish retention criteria and initiate the purge.	Obsolete data is purged from the database.	Item C21-1 is successful
C21-9	Final verification of SPSR<=>Operator Workstation interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.2 NPG <==> NFE Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C22-1	Configuring of the NFE	Reboot the NFE; Startup the NPG.	The NFE is configured with the expected port assignments and IP address.	NPG and NFE segment verification is successful
C22-2	Monitor NFE Ports	Remove the clock line from the patch panel for port 3.	Verify that the NPG reports the loss of clock on that port.	Item C22-1 is successful
C22-3	Final verification of NPG<=>NFE interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above items are successfully completed.

C.2.3 SPSR <==> NPG interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C23-1	Establish service connections with SPSR	Power up the NPG	NPG sends CTM to NTS; upon successful ACK, NPG establishes all applicable service connections as defined in its configuration table.	SPSR and NPG segment verification is successful
C23-2	Support for Acquisition Data Dissemination service (open)	Transmit IIRVs from SPSR to GTs (configure VTRS if necessary).	NTS receives IIRV message on correct NFE port; NPG receives ACK .	Item C22-1 is successful
C23-3	Reception of GAM from GT	Transmit multiblock GAM from the NTS.	The NTS sends the GAM; applicable service connections are established between the NPG and the SPSR; GAM is converted to e-mail. Alert operator, who reviews message.	Item C23-2 is successful
C23-4	Transmit flexible USM to secure MOC	Send in SAR from NTS; (configure STRS if necessary)	Event is added to active schedule; applicable service connection established between NPG and SPSR; Flexible USM received by NTS NFE on expected port.	Item C23-1 is successful
C23-5	Support for SDPF Schedule message service; NPG monitors ACK for SPSR	Disable ACKs for SDPF at the NTS; Activate an STRS and transmit a SAR from the NTS such that it adds an event to the active schedule and sends out a NES message to SDPF.	The SPSR receives the SAR and transmits SRM; schedules event and sends NES message 3 times; the NPG aborts the applicable service connections for SDPF. NPG begins transmitting CTMs to reestablish communications.	Item C22-2 is successful
C23-6	Final verification of SPSR<=>NPG interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.4 CCS <==> Operator Workstation Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C24-1	Logon verification, identification, and privileges	Logon to operator workstation as member of TNC group and as member of PA group	Each operator receives a different toolbar. Correct usernames are displayed.	Segment verification for CCS and workstations is complete
C24-2	Access a new window.	Access the window to view the SMAR reconfiguration display.	New window shows correct parameter information.	Item C24-1 is successful
C24-3	Final verification of CCS<==>Operator Workstation interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.5 CCS <==> NPG interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C25-1	CTM/ACK exchange with GTs.	Startup CCS and NPG	The NTS NFE receives the CTM on the expected port and the corresponding ACK received by the CCS; retransmissions from the CCS do not occur	CCS and NPG segment verification is successful
C25-2	Routing of inbound message to CCS	Transmit a UPD Request message (92/04) from the NTS.	The message is received by the CCS; retransmissions from the NTS do not occur.	Item C25-1 is successful
C25-3	Routing of inbound message to CCS (via NFE)	Transmit a multiblock RCTD message from the NTS for a secure customer.	The message is received and sent by the CCS; retransmissions from the NTS or CCS do not occur.	Item C25-1 is successful
C25-4	Reset socket between CCS and the NPG.	From applicable GUI, reset the socket between the CCS and the NPG.	Socket from CCS to NPG is aborted; Transmission of auto CTMs is temporarily interrupted; socket is reestablished and auto CTMs resume.	Item C25-1 is successful
C25-5	Concurrent processing of multiblock messages.	Transmit multiblock ODMs from the NTS with UPD selected for a customer.	The ODMs are received and UPD is sent by the CCS as expected.	Item C25-1 is successful
C25-6	Final verification of CCS<=>NPG interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.6 SPSR <==> CCS Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C26-1	Operator-initiated transfer of SN data from SPSR to CCS	Logon to operator workstation as member of SYST group and navigate windows as needed; select option to update CCS SN data files	Windows are displayed as expected; CCS SN data files are rebuilt (new) and contain the same data as the SPSR database.	Segment verification is successfully completed
C26-2	Automatic exchange of event information for HIJ services	Disable 03/51; Initiate transmission of SHOs to STGT.	Trigger generated for event update; Complete event information is resident on CCS.	Item C26-1 is successful.
C26-3	IFL SHO Updates are processed.	Initiate SHO transmission to WSGTU which includes IFL SHOs related to the events transmitted previously.	CCS is notified of the change in IFL SHO status and accesses the necessary information to update the CCS event file.	Item C26-2 is successful
C26-4	Reconfiguration of HIJ services.	Transmit an invalid GCMR for a SMAR service in an event transmitted in Item C26-2.	CCS accesses the SMAR service parameters on the SPSR database and determines that the GCMR has a parameter out of range. Sends 98/0x message back to the MOC.	Item C26-2 is successful.
C26-5	Automatic exchange of event delete information	From applicable GUI, select event from C26-3 and delete it from the schedule.	Trigger generated for event delete; Event information is removed from CCS.	Item C26-4 is successful.
C26-6	Final verification of SPSR<=>CCS interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.7 SPSR/CCS <==> NPG Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C27-1	Event Status Information	Transmit multiblock SLR and a SHO Status OPM (Reject) from WSGTU for an event transmitted in Item C26-3.	Alerts and GUIs indicate correct event status information. Also SLR windows display the information in the SLR accurately.	SPSR/NPG and CCS/NPG interface activities were successful
C27-2	Routing of concurrent messages and ACK's	Transmit multiblock ODMs and TT messages from the NTS; at the same time transmit SHOs and Vectors to from the SPSR and UPD from CCS.	SPSR, CCS, and NTS receive all messages successfully; retransmissions from the CCS, NPG, or NTS do not occur; NTS does not report multiblock message errors.	Item C26-2 is successful.
C27-3	Final verification of SPSR/CCS<=>NPG interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.8 SPSR <==> NTS NPG Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C28-1	Establish service connections with SPSR	Power up the NTS NPG. Execute utility to establish service connections with SPSR as indicated by its configuration files.	NTS NPG establishes all applicable service connections as defined in its configuration table.	SPSR and NPG segment verification is successful
C28-2	Echo of CTM.	Send a CTM from the NTS NPG to the SPSR on an established service connection.	SPSR echoes the CTM back to the NTS NPG on the same service connection.	Item C28-1 is successful
C28-3	Support for Acquisition Data Storage service (open)	Transmit a IIRV message (03/10) from the NTS.	NTS NPG sends ACK to NTS; SPSR receives IIRV message and stores information in database.	Item C28-1 is successful
C28-4	Support for Schedule Request services (open) and Schedule Status service.	Activate an STRS and transmit a SAR from the NTS such that it adds a flexible event to the active schedule and sends out an SRM and a Flexible USM.	The SPSR receives the SAR and transmits SRM; schedules event and sends Flexible USM message.	Item C28-1 is successful
C28-5	Support for TSW Storage service (open)	Transmit a TSW message from the NTS.	NTS NPG sends ACK to NTS; SPSR receives TSW message and stores information in database.	Item C28-1 is successful
C28-6	Final verification of SPSR <=> NTS NPG interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.9 NPG <==> NTS NPG Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C29-1	Establish service connections with NPG	Power up the NTS NPG. Execute utility to establish service connections with NPG as indicated by its configuration files.	NTS NPG establishes all applicable service connections as defined in its configuration table.	NPG segment verification is successful
C29-2	Echo of CTM.	Send a CTM from the NTS NPG to the NPG on an established service connection.	NCC NPG echoes the CTM back to the NTS NPG on the same service connection.	Item C29-1 is successful
C29-3	ACK for CCS CTM to a TCP MOC.	Send a CTB from the CCS.	NCC NPG receives CTB, verifies that a service connection exists for the TCP MOC, and ACKs the CTM (back to CCS).	Item C29-1 is successful
C29-4	Support for User Performance Data service (open)	With ODMs being received from the GT, transmit a UPDR message (92/04) from the NTS.	NTS NPG sends ACK to NTS; CCS receives UPDR message and begins sending UPD; UPD is routed over applicable service connection to the NTS NPG (and onto the NTS?).	Item C29-1 is successful
C29-5	Support for Reconfiguration services (open)	Transmit a GCMR from the NTS.	The CCS receives the GCMR and transmits OPM; returns disposition and OPM status.	Item C29-1 is successful
C29-6	Exchange of Nascom SCD information.	[TBD]	SCD configuration information is downloaded to the NCC NPG.	Item C29-1 is successful
C29-7	Final verification of NPG <=> NTS NPG interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.10 NTS NPG <==> KDC Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C210-1	Establish Kerberised service connections (both types) with SPSR	Power up the NTS NPG. Execute utility to establish Kerberised service connections with SPSR as indicated by its configuration files.	NTS NPG establishes all applicable Kerberised service connections as defined in its configuration table. The NTS NPG accesses the KDC during credential exchange.	KDC segment verification is successful
C210-2	Establish Kerberised (both types) service connections with NPG	Power up the NTS NPG. Execute utility to establish Kerberised service connections with NPG as indicated by its configuration files.	NTS NPG establishes all applicable Kerberised service connections as defined in its configuration table.	NPG segment verification is successful
C210-3	Support for Acquisition Data Storage service (Identified TCP)	Transmit a IIRV message (03/10) from the NTS.	SPSR receives IIRV message and stores information in database; NTS NPG accesses KDC during credential exchange.	Item C210-1 is successful
C210-4	Denial of service for Acquisition Data Storage service (Identified TCP)	Transmit a IIRV message (03/10) from the NTS referencing a SIC not authorized for this user.	SPSR receives IIRV message and does not store information in database; operator is alerted.	Item C210-1 is successful
C210-5	Support for Schedule Request services (Confidential TCP)	Activate an STRS and transmit a SAR from the NTS such that it adds a flexible event to the active schedule and sends out an SRM and a Flexible USM.	The SPSR receives the SAR and transmits SRM; schedules event and sends Flexible USM message. Through "Sniffer" verify that the messages were encrypted; NTS NPG accesses KDC during credential exchange.	Item C210-1 is successful

C210-6	Support for Reconfiguration services (Identified)	Transmit a GCMR from the NTS.	NPG inserts valid user ID/password and Nascom information into the message. The CCS receives the GCMR and ACKs; CCS transmits OPM and returns disposition and OPM status.	Item C210-2 is successful
C210-7	Denial of Reconfiguration services (Identified)	Transmit a GCMR from the NTS for a SUPIDEN not authorized for the user.	The NPG (or CCS?) receives message; detects authorization failure; service connection is aborted; operator is alerted.	Item C210-2 is successful
C210-8	Support for User Performance Data service (Confidential)	With ODMs being received from the GT, transmit a UPDR message (92/04) from the NTS.	CCS receives UPDR message and begins sending UPD; UPD is routed over applicable service connection to the NTS NPG; Through "Sniffer" verify that the messages are encrypted; Both NTS NPG and NPG access KDC during credential exchange.	Item C210-2 is successful
C210-9	Final verification of KDC <=> NTS NPG interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.11 SPSR <==> Web Server <==>NTS NPG Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C211-1	Access TUT tables in SPSR database.	Generate TUT on the SPSR.	The current TUT information stored in the SPSR database is FTP'd to (replicated on) the web server	Web Server and SPSR segment verification is successful.
C211-2	Access TUT tables on web server.	From web browser on NTS NPG (?) issue request to review TUT (SA) for a specific time range.	The browser displays a web page that shows the current TUT information stored in the SPSR database.	Item C211-1 is successful.
C211-3	Receive Nascom schedule messages; construct schedule for web page. [TBD]	Transmit NES messages from SPSR to TUT/NES server. From web browser on NTS NPG (?) review TUT for a specific time range	The TUT/NES receives the NES messages; schedule viewable from web browser external to NCCDS.	TUT/NES server and SPSR segment verification is successful.
C211-4	Receive Nascom schedule reconfiguration information; display on web page. [TBD]	Transmit GCMR from NTS to CCS. From web browser on NTS NPG (?) review NES schedule information for a applicable time range	The TUT/NES receives the NRR messages; changes to schedule viewable from web browser external to NCCDS.	Item C211-3 is successful.
C211-5	Denial of Nascom Schedule Information Access	Configure NTS NPG to be a MOC (i.e., not the NOC). Attempt to review the Nascom schedule information.	The access to the Nascom schedule information is denied	
C211-6	Final verification of SPSR <=> TUT/NES interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.12 NFW Integration Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C212-1	NFW is transparent to the SPSR<==>NTS NPG interface.	Repeat Item C28-6.	Same as those observed for Item C28-6.	NFW segment verification is successful; Item C28-6 is successful.
C212-2	NFW is transparent to the NPG<==>NTS NPG interface.	Repeat Item C29-7.	Same as those observed for Item C29-7.	Item C29-7 is successful.
C212-3	NFW is transparent to the KDC<==>NTS NPG interface.	Repeat Item C210-9.	Same as those observed for Item C210-9.	Item C210-9 is successful.
C212-4	NFW is transparent to the SPSR<==>NPG interface.	Repeat Item C23-6.	Same as those observed for Item C23-6.	Item C23-6 is successful.
C212-5	NFW is transparent to the CCS<==>NPG interface.	Repeat Item C25-6.	Same as those observed for Item C25-6.	Item C25-6 is successful.
C212-6	NFW is transparent to the SPSR<==>Web Server interface.	Repeat Item C211-5	Same as those observed for Item C211-5.	Item C211-5 is successful.
C212-7	NFW denial of service.	Attempt to establish a service connection on a port for which the requester is unauthorized.	NFW does not allow the service connection to be established.	Item C212-6 is successful.

C.2.13 NSM <==> SPSR Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C213-1	Remote startup of SPSR application software	Logon to NSM workstation; Enter necessary information to start SPSR applications from NSM workstation.	The SPSR server and applications are started just as they were during the SPSR segment verification.	Segment verification for SPSR and NSM is complete
C213-2	Perform/control SPSR database backup.	Initiate (control initiation) of database backup from NSM workstation	TNC operator receives the start alert; other operator groups do not.	Item C213-1 is successful
C213-3	Manual switchover from prime server to backup. [TBD]	From NSM client, initiate switchover to “hot” backup server.	Applications and database on backup system assume operational control.	Item C213-1 is successful
C213-4	Failure (event) that generates a trouble ticket.	Simulate a failure intended to generate a trouble ticket.	SPSR failure is noted by NSM. Resulting trouble ticket added to NSM database.	Item C213-3 is successful.
C213-5	Final verification of NSM<=>SPSR interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.14 NSM <==> Operator Workstation Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C214-1	Remote startup of operator workstation application software	Logon to NSM workstation; Enter necessary information to start an operator workstation application software from the NSM.	The operator workstation and the application software are started just as they were during the operator workstation segment verification.	Segment verification for the operator workstation and NSM is complete
C214-2	Perform/control operator workstation backup. [TBD]	Initiate (control initiation) of disk backup from NSM workstation	Workstation baseline is copied to tape for archival.	Item C214-1 is successful
C214-3	Failure (event) that generates a trouble ticket.	Simulate a failure intended to generate a trouble ticket.	Workstation failure is noted by NSM . Resulting trouble ticket added to NSM database.	Item C214-2 is successful.
C214-4	Final verification of NSM<=>Operator Workstation interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.15 NSM <==> CCS Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C215-1	Gathering of system statistics	Enter correct information to review the statistics being collected for CCS.	Statistics are shown to the operator.	Segment verification for the CCS and NSM is complete
C215-2	Failure (event) that generates a trouble ticket.	Simulate a failure intended to generate a trouble ticket.	CCS failure is noted by NSM. Resulting trouble ticket added to NSM database.	Item C215-1 is successful.
C215-3	Final verification of NSM<=>CCS interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.16 NSM <==> NPG Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C216-1	Gathering of system statistics	Enter correct information to review the statistics being collected for NPG.	Statistics are shown to the operator.	Segment verification for the NPG and NSM is complete
C216-2	Downloading of endpoint definition tables.	From the NSM, modify and download the endpoint definition table of the NPG.	NPG receives and uses the new endpoint definition table.	Item C216-1 is successful
C214-3	Failure (event) that generates a trouble ticket.	Simulate a failure intended to generate a trouble ticket.	NPG failure is noted by NSM. Resulting trouble ticket added to NSM database.	Item C216-2 is successful.
C216-4	Manual switchover from prime server to backup. [TBD]	From NSM client, initiate switchover to backup server.	Applications and database on backup system assume operational control.	Item C216-1 is successful
C216-5	Final verification of NSM<=>NPG interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.17 NSM <==> NFW Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C217-1	Gathering of system statistics	Enter correct information to review the statistics being collected for NFW.	Statistics are shown to the operator.	Segment verification for the NFW and NSM is complete
C217-2	Downloading of configuration information.	From the NSM, modify and download configuration information to the NFW.	NFW receives and uses the new configuration information.	Item C217-1 is successful
C217-3	Failure (event) that generates a trouble ticket.	Simulate a failure intended to generate a trouble ticket.	NFW failure is noted by NSM. Resulting trouble ticket added to NSM database.	Item C217-1 is successful.
C217-	Manual switchover from prime server to backup. [TBD]	From NSM client, initiate switchover to backup firewall.	Applications and configuration information on backup system assume operational control.	Item C217-1 is successful
C217-4	Final verification of NSM<=>NFW interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.18 NCD <==> CCS Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C218-1	Delogging of CCS blocks (messages) from NCD	Request a screen report of all ODMs/UPD transmitted for a 5 minute period.	All ODMs and UPD messages received/sent by the CCS are displayed on the NCD monitor. Operator has choice of printing or saving.	Segment verification for the NCD and CCS is complete
C218-2	Delogging of CCS blocks (messages) archived on tape.	Request printout of CCS messages from a time frame prior to the log files resident on disk.	All applicable messages are read from the tape and printed.	Item C218-1 is successful.
C218-3	Delogging of other logged information.	Request printout of other information (i.e., not formatted messages) logged by the CCS.	Other information., such as operator alerts and process status messages are printed in the report.	Item C218-1 is successful.
C218-4	Final verification of NCD<=>CCS interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.19 NCD <==> SPSR Interface Verification Activities

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C219-1	Delogging of SPSR messages from NCD to printer.	Request a screen report of all SHOs and USMs transmitted for a 5 minute period.	All SHOs and USMs sent by the SPSR are displayed on the NCD monitor. Operator has choice of saving.	Segment verification for the NCD and SPSR is complete
C219-2	Delogging of other logged information.	Request printout of other information (i.e., not formatted messages) logged by the SPSR.	Other information., such as operator alerts and process status messages are printed in the report.	Item C219-1 is successful.
C219-3	Delogging of SPSR messages archived on tape.	Request printout of SPSR messages from a time frame prior to the log files resident on disk.	All applicable messages are read from the tape and printed.	Item C219-1 is successful.
C219-4	Final verification of NCD<=>SPSR interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.2.20 NCD<==>NPG Interface

Identifier	Capability to be Verified	Action/Event	Expected Results	Dependencies
C220-1	Delogging of NPG blocks (UDP) from NCD.	Request a screen report of all ODMs and SARs transmitted for a 5 minute period.	All ODMs and SARs received by the NPG are displayed on the NCD monitor. Operator has choice of printing or saving.	Segment verification for the NCD and CCS is complete
C220-2	Delogging of NPG messages from NCD.	Request a printed report of all UPD and SARs transmitted for a 5 minute period.	All UPD and SARs sent by the NPG are displayed on the NCD monitor. Operator has choice of printing or saving.	Item C220-1 is successful.
C220-3	Delogging of NPG blocks (UDP) and messages (TCP) from NCD.	Request a screen report of all ODMs, UPD, and SARs transmitted for a 5 minute period.	All ODMs and SAR blocks received by the NCD and the UPD and SAR messages sent by the NCD are displayed on the NCD monitor. Operator has choice of printing or saving.	Items C220-1 and C220-2 are successful.
C220-4	Delogging of other logged information.	Request printout of other information (i.e., not formatted messages) logged by the NPG.	Other information., such as operator alerts and process status messages are printed in the report.	Item C220-3 is successful.
C220-5	Delogging of NPG blocks and messages archived on tape.	Request printout of NPG blocks and messages from a time frame prior to the log files resident on disk.	All applicable messages are read from the tape and printed.	Item C220-4-1 is successful.
C220-6	Final verification of NCD<=>NPG interface	Execute INCC1nn-B2.x	As documented in the test procedure.	Above Items are successfully completed.

C.3 Switchover Scenario Verification Activities

The activities to be performed to verify that the switchover between the prime and backup components of each specific segment is properly implemented are identified below. Each table corresponds to a redundant segment being delivered as part of NCCDS 98 Build C.

NOTE

The activities listed in this section are subject to change as a result of additional information and/or NCCDS 98 changes that are not foreseen at this time.

C.3.1 SPSR Switchover Verification Activities

[TBD]

C.3.2 CCS Switchover Verification Activities

[TBD]

C.3.3 NPG Switchover Verification Activities

[TBD]

C.3.4 NFE Switchover Verification Activities

[TBD]

C.3.5 NFW Switchover Verification Activities

[TBD]

C.3.6 NSM Switchover Verification Activities

[TBD]

Appendix D. External Simulation Diagrams

D.1 Build A External Interfaces

D.1.1 Ground Terminals

Because the first build of the SPSR will not support transmissions to the ground terminals, the ground terminal interface is restricted to real-time messages in Build A. This interface will be simulated by the NTS and these NCCDS components: the CCS, the Interim NPG (INPG), and the NCC NFE. This interface and related protocols are illustrated in Figure D-1.

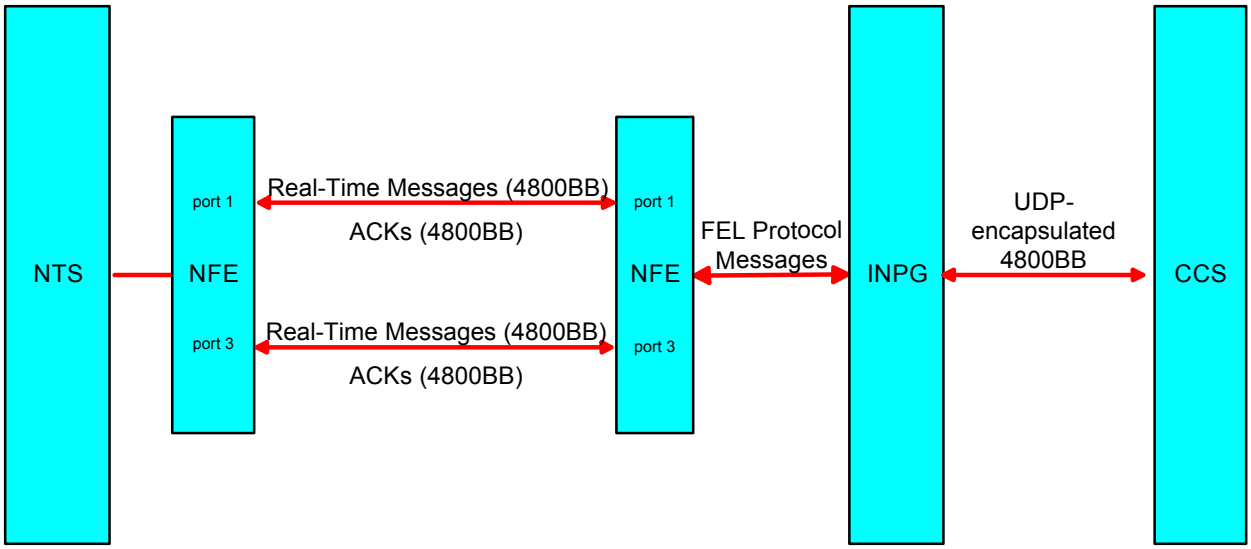

Figure D-1. Ground Terminal Simulation in NCCDS 98 Build A

D.1.2 Customers

D.1.2.1 Scheduling Messages and TDRS Scheduling Window (TSW) Messages

The first build of SPSR will only support schedule requests, TSW messages, and Schedule Result Messages to/from customers. However, SPSR will only communicate with external entities using the TCP/IP protocol. Therefore, the SPSR and the NTS cannot communicate directly. The Interim NPG (INPG) will provide protocol conversion services so that 4800BB SARs sent from the NTS are converted to TCP/IP messages for SPSR to process. The schedule requests and the TSW messages are received by the SPSR on a SN Schedule Request service connection and a TSW Storage service connection, respectively. The Interim NPG also provides the reverse protocol conversion for SRMs sent by the SPSR to the NTS. The SRMs are sent by the SPSR on an SN Schedule Request Status service connection. In addition, the SPSR will not

expect or process 4800BB acknowledgment messages. Therefore, the Interim NPG consumes all such acknowledgments. This interface and related protocols are illustrated in Figure D-2.

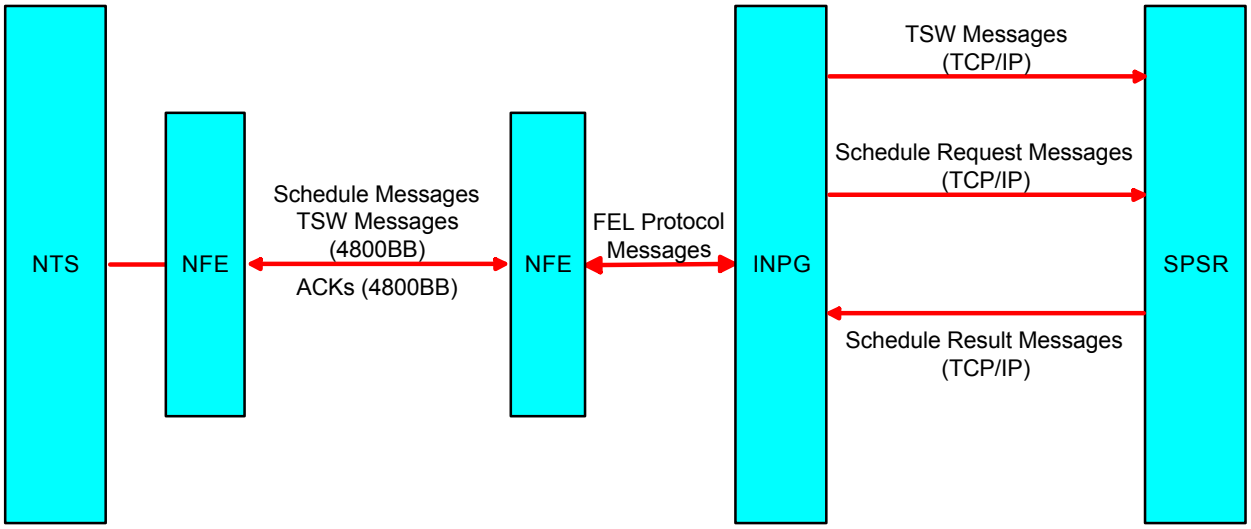

Figure D-2. Customer Scheduling Simulation in NCCDS 98 Build A

D.1.2.2 Real-Time Messages

The capability of CCS to receive and process real-time messages from the NTS will not change for NCCDS 98 Build A. However, because the CCS will process UDP-encapsulated 4800BB, vice FEL packets, the INPG must translate the between FEL packets to/from the NFE and UDP-encapsulated 4800BB for blocks to/from the CCS. For messages bound for the NTS, the INPG must multiplex the real-time messages from the CCS with the SRMs coming from the SPSR according to Nascom 4800BB protocol. Because CCS will still require 4800BB acknowledgments, the INPG must also determine if an acknowledgment from the NTS is a response to a real-time message, and, if so, route that acknowledgment to CCS. This interface and related protocols are illustrated in Figure D-3.

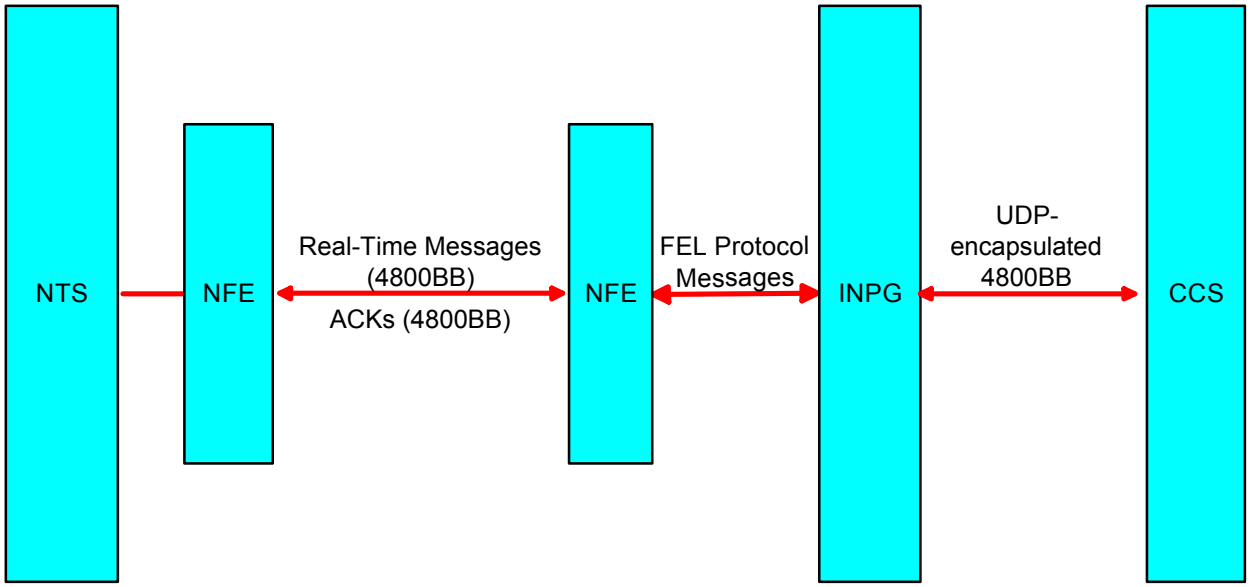

Figure D-3. Real-Time Message Simulation in NCCDS 98 Build A

D.1.2.3 Support Facilities

The first build of the SPSR will not support schedule transmissions to support facilities such as SDPF. However, CCS will still support the transmission of Nascom Reconfiguration Requests (NRRs) to SDPF for events that specify that SDPF support is required. Because the NRR is a real-time message from CCS as discussed in the previous section, this interface follows the same simulations and protocols as described in the previous section. This interface and related protocols are illustrated in Figure D-4.

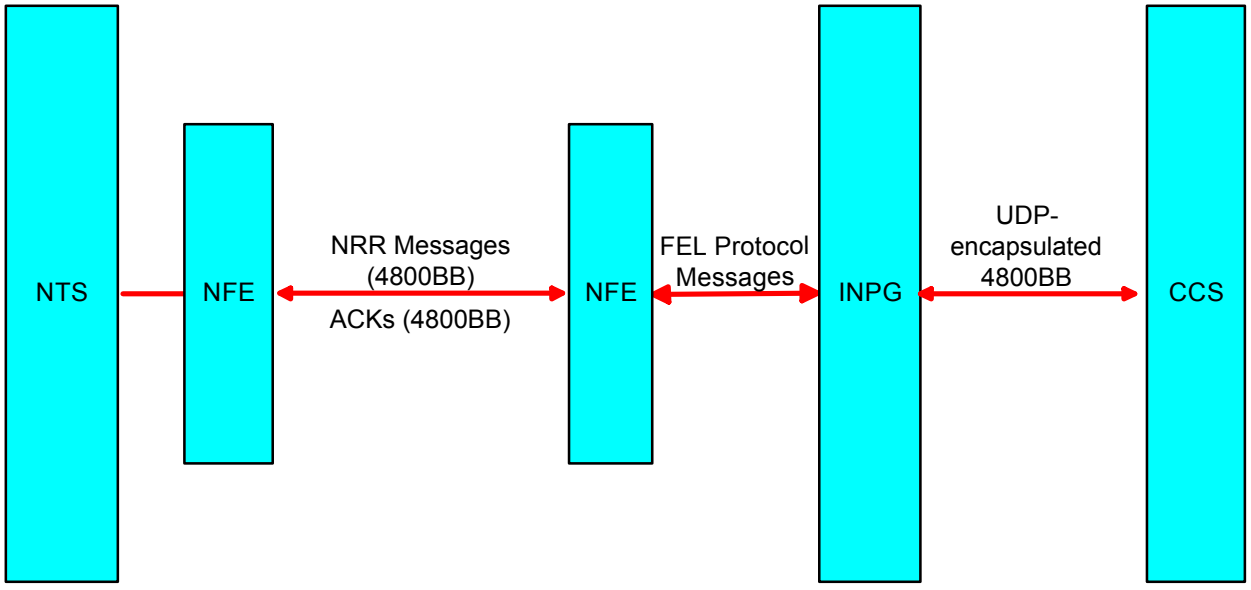

Figure D-4. SDPF Real-Time Message Simulation in NCCDS 98 Build A

D.2 NCCDS 98 Build B Simulation

NCCDS 98 Build B introduces one new external interface. Specifically, the interface between the SPSR and the ground terminals for the transmission of vectors is added in Build B. Build B also introduces the acquisition data interface between the SPSR and the MOCs. However, this interface is the same as that depicted in Figure D-2 except that it has a unique service connection.

D.2.0.1 Acquisition Data Messages to the Ground Terminals

The NTS is still used to simulate the ground terminal interface, and therefore, all acquisition data messages flow between the SPSR and the NTS. However, this message flow requires the conversion to and from several different protocols as illustrated in Figure D-5.

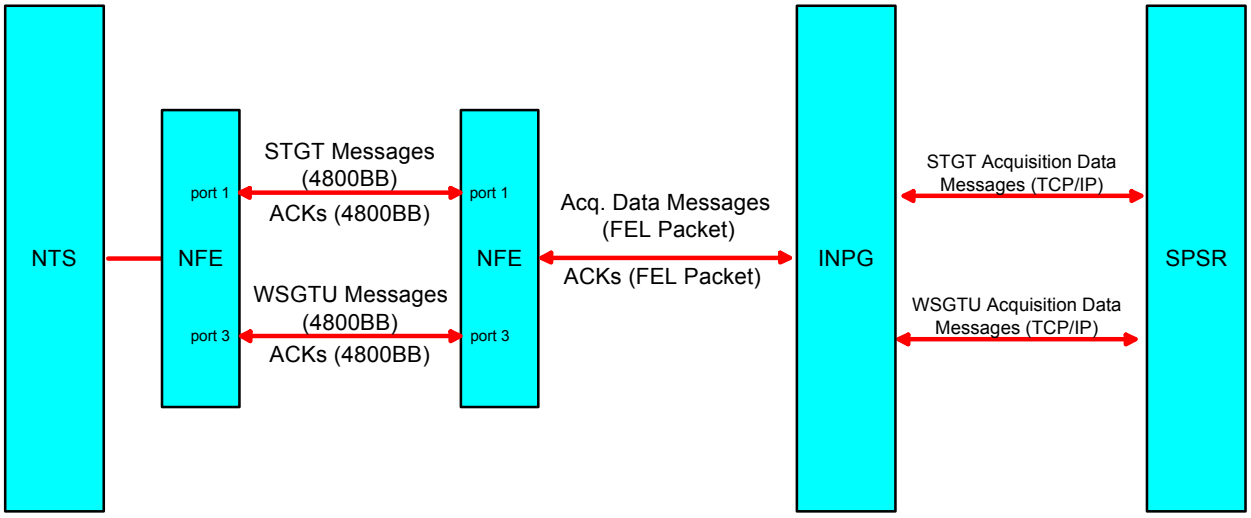

Figure D-5. Acquisition Data Message Simulation in NCCDS 98 Build B

The INPG, as a client, establishes a TCP/IP acquisition data dissemination service connection with the SPSR. This connection is established by the INPG formatting and transmitting a vector request (VR) message to the SPSR for each ground terminal. Once the service connection is established, the SPSR can send the acquisition data messages to the INPG over the TCP/IP service connection. The INPG then converts the TCP/IP message into a FEL Packet and routes it over the OpsLAN to the NFE. The NFE then extracts the pure 4800-bit blocks from the FEL Packet and sends them over the RS-422 interface indicated by the NFE port number in the FEL Packet. The 4800-bit blocks are received by the NTS through its NFE interface.

As stated before, the SPSR does not process 4800BB acknowledgments. Therefore, if the NTS responds with an acknowledgment it would be received by the NCC NFE and routed over the OpsLAN to the NPG, where it would be consumed. Failure to receive such an acknowledgment will cause the NPG to begin retransmissions in accordance with current Nascom protocol. Failure of three transmissions will cause the NPG to drop (abort) all of the service connections between the NPG and the SPSR for that ground terminal. For a message originating from the NTS, the NPG is responsible for responding with the 4800BB acknowledgment. Failure to

receive the acknowledgment will cause the NTS to retransmit the message in accordance with Nascom protocol. However, failure of three transmissions does not have any effect on the NTS.

D.3 NCCDS 98 Build C Simulation

For the final build of NCCDS 98, the number of external interfaces, and the complexity of simulating them, is greatly increased. In addition to the full implementation of the SPSR external communications, the Nascom IP transition introduces another protocol that the NCCDS must support. With the Nascom transition to IP, unsecure MOCs that remain 4800BB-based (i.e., do not become TCP/IP MOCs) will have the 4800BB encapsulated in a UDP datagram for delivery through the Nascom IP network. However, it should be clearly stated that Nascom's UDP encapsulation and CCS's UDP encapsulation are different. The Nascom UDP encapsulation includes a Real-Time Protocol payload for sequence numbering and format type fields. Conversely, because the CCS does not require these fields, the NCC adopted a UDP encapsulation scheme that did not use the RTP payload. Therefore, the "Final" NPG must be able to support the two different forms of UDP encapsulation.

With the final build NCCDS 98, the NPG will no longer communicate through the NFE for communications with the MOCs. Instead, the NPG and the MOCs will communicate over the Closed IONET network. All communications between the MOCs (as well as SDPF and FDF) and the NPG (and the SPSR) will be filtered through the NCC Firewall (NFW).

The simulation of the external interfaces supported by NCCDS 98 Build C are described in more detail below. Refer to Figure 2-3 for the NCCDS 98 Build C architecture.

D.3.1 Ground Terminals

The interface between the NCCDS and the ground terminals will be fully implemented in this build. Simulating this external interface varies depending on the type of message: scheduling and acquisition data messages, real-time support messages, Service Level Requests (SLRs), or Free-text messages.

NOTE

The description of these interfaces could change as a result of the Nascom IP transition. The descriptions below are based on current information and planning.

D.3.1.1 Scheduling and Acquisition Data Messages

In general, this interface is the same as that depicted in the previous section. However, there are a few differences that are highlighted in the following paragraphs. The simulation of this interface, showing the Final NPG, is illustrated in Figure D-6.

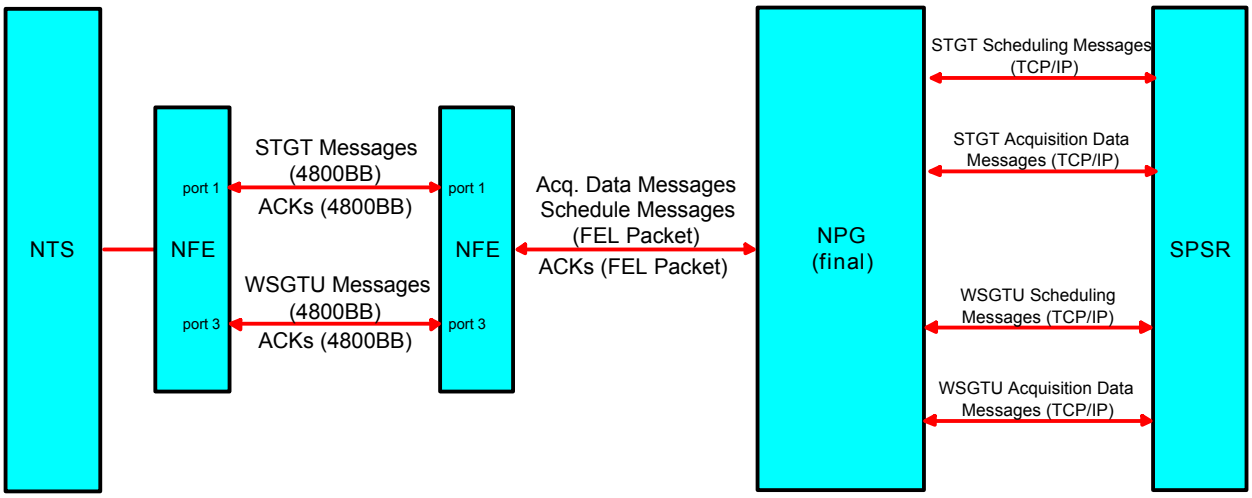

Figure 0-6. GT Simulation - Scheduling and Acquisition Data Messages

For scheduling messages, the SPSR acts as the client and, therefore, is responsible for establishing applicable TCP/IP service connection with the NPG. The SPSR then sends the scheduling messages, if any, to the NPG over the TCP/IP service connection. For acquisition data messages, the NPG still serves as the client, using the VR message to establish the applicable service connection. In Build C, other messages, such as the Delta-T message, are added to the acquisition data message set. Once the NPG has received the message, either a scheduling message or an acquisition data message, it converts the TCP/IP message into a FEL Packet and routes it over the OpsLAN to the NFE. The remainder of the message flow is the same as that described in the previous section.

With Build C, the ground terminal interface also included messages that originate from the ground terminal and are sent to the NCCDS. Such messages, for example State Vector Reject messages, Real-Time Mode messages, SHO Status messages, etc., follow the reverse protocol conversion flow as that described in the previous section. The NPG is responsible for generating the necessary ACK message for messages bound for the SPSR. Some of the messages from the ground terminal, like the SHO Status message, are routed by the NPG to multiple entities within the NCCDS. This message flow is illustrated in the SLR section below. In cases where the CCS is one the multiple entities, the CCS is responsible for generating the appropriate ACK message.

D.3.1.2 Real-Time Messages

The simulated ground terminal interface for real-time messages is the same as that described in Section D.1.1, except the Final NPG has replaced the INPG. With this build, the real-time messages, particularly ODMs, will include information for TDRS HIJ service types.

D.3.1.3 Service Level Reports

This particular message is used as an example for the special case messages that are received and processed by multiple segments within the NCCDS. There are several messages that are to be received by some combination of CCS, SPSR, and SAS. The SAS receives messages over TCP/IP service connections, so the NPG-to-SAS interface is analogous to the NPG-to-SPSR interface. The SLR simulation and the related protocols are illustrated in Figure D-7.

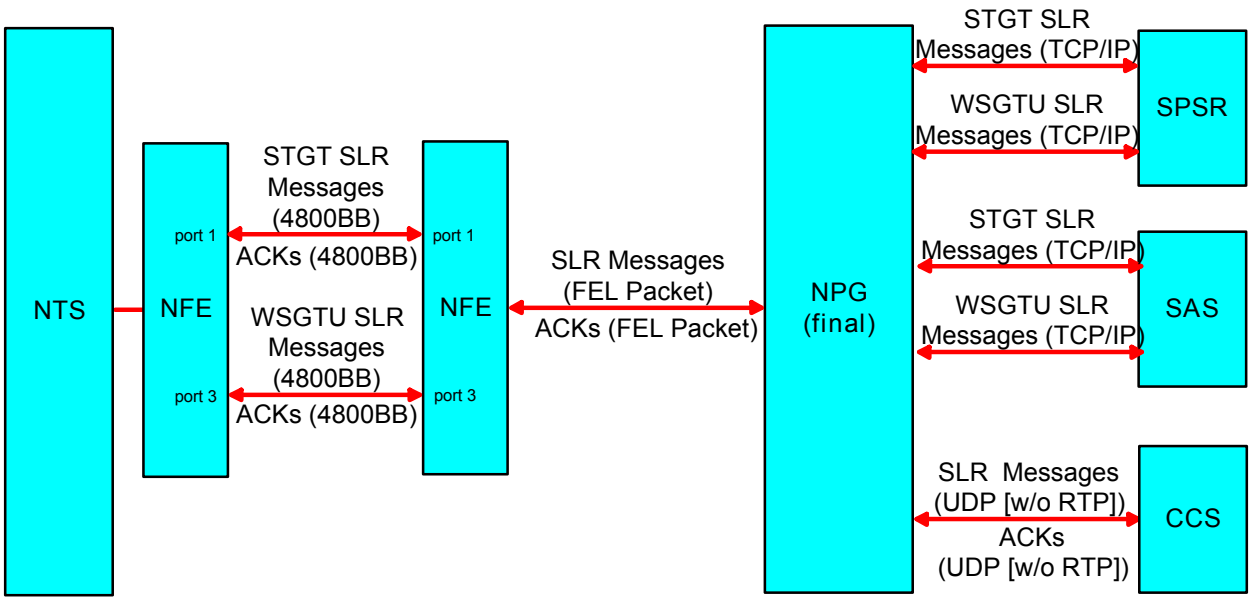

Figure D-7. GT Simulation - Service Level Report Messages

An SLR message leaves the NTS NFE as pure 4800-bit blocks and is received by the NCC NFE. The NCC NFE then creates an FEL Packet from the pure 4800-bit blocks and sends it to the NPG. The NPG determines that the message is to be received by the CCS and the SPSR. The NPG then converts the 4800BB SLR to UDP-encapsulated (without RTP) 4800-bit blocks addressed to the CCS. The NPG also creates a TCP/IP message addressed to the SPSR (the related service connection, the SN Equipment Status service, is established by the SPSR and maintained as a "permanent' connection).

For this example, because the CCS is one of the recipients of the message, the CCS is responsible for responding with the 4800BB acknowledgment. For cases where the CCS is not one of the recipients, the NPG is responsible for generating the ACK message. Failure to receive the acknowledgment will cause the NTS to retransmit the message in accordance with Nascom protocol. However, failure of three transmissions does not have any affect on the NTS. The NPG will receive the retransmitted message and forward it to the CCS in accordance with the protocol conversion described above. The NPG will not forward a duplicate copy to the SPSR; the TCP/IP mechanisms should ensure that the original message will be received by the SPSR.

D.3.1.4 General Administration Messages

In NCCDS 98, all general administration message (GAM) processing will be performed by the SPSR. In all cases, the entity sending the GAM assumes the role of the client and is responsible for establishing the necessary TCP/IP service connection. The SPSR will establish such a service connection on an as-needed basis, closing the connection when the GAM transmission is completed. For a GAM from the GT, the NPG will serve as a proxy client for the GT. Once this service connection is established, it will be maintained as a "permanent" connection. The GAM interface and its related protocols are illustrated in Figure D-8.

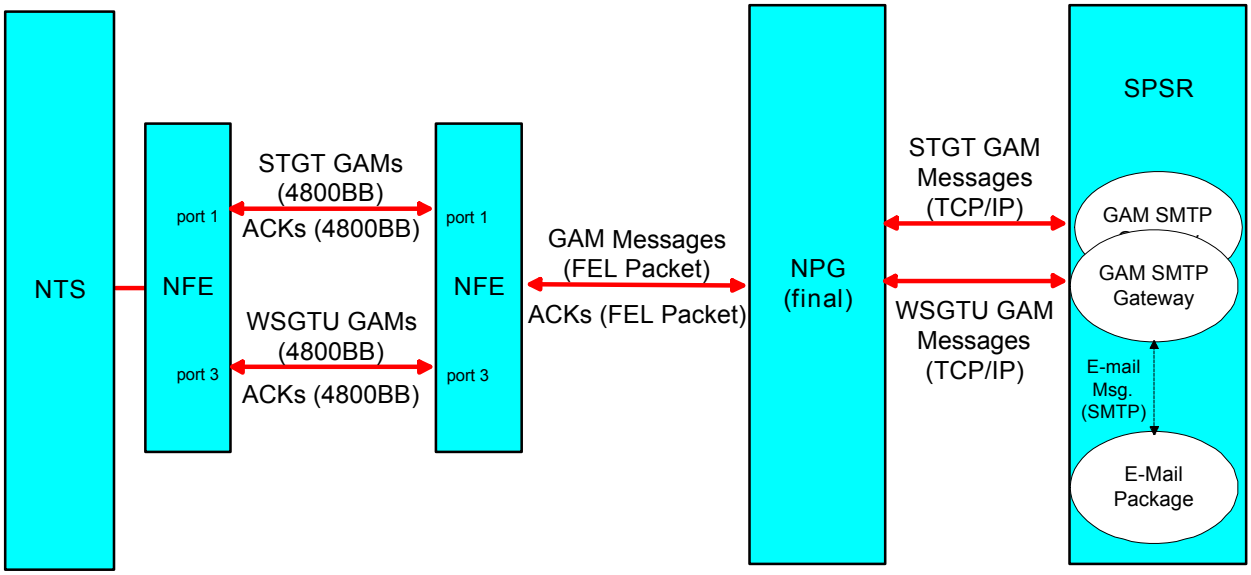

Figure D-8. GT Simulation - General Administration Messages

The NCC operator accesses the electronic mail package from the operator workstation. The operator accesses an E-mail template for the particular GAM to be sent. The operator enters the necessary information and sends the e-mail using the Simple Mail Transport Protocol (SMTP). The e-mail message is received by an SPSR process which takes the e-mail message and formats the applicable GAM in accordance with the WSC ICD. This SPSR process then establishes a TCP/IP service connection and transports the messages to the NPG. The NPG converts the TCP/IP message into an FEL Packet and routes it over the OpsLAN to the NFE. The NFE then extracts the pure 4800-bit blocks from the FEL Packet and sends them over the RS-422 interface indicated by the NFE port number in the FEL Packet. The 4800-bit blocks are received by the NTS through its NFE interface.

As before, the SPSR does not process 4800BB acknowledgments. Therefore, if the NTS responds with an acknowledgment it would be received by the NCC NFE and routed over the OpsLAN to the NPG, where it would be consumed. Failure to receive such an acknowledgment will cause the NPG to begin retransmissions in accordance with current Nascom protocol. Failure of three transmissions will cause the NPG to abort the service connection between the NPG and the SPSR. For a GAM originating from the NTS, the NPG is responsible for responding with the 4800BB acknowledgment. Failure to receive the acknowledgment will cause the NTS to retransmit the message in accordance with Nascom protocol. However, failure of three transmissions does not have any effect on the NTS.

D.3.2 Customers

NCCDS 98 will support interfaces with two types of customers, which will be referred to as 4800BB customers and TCP/IP customers. The TCP/IP customers can be of two types - those that use Kerberised service connections and those that use “open” services. The NTS remains the basis for simulating the external customers. However, since the NTS will remain pure 4800BB-based, several configurations will be required to simulate the several type of customer interfaces supported by NCCDS 98.

D.3.2.1 4800BB-Based Customers

The interface between the NCCDS and those customers that remain 4800BB-based will vary according to what type of messages is being exchanged. For scheduling and acquisition data messages, the NPG will serve as a proxy client for the customer, transparently providing a TCP/IP interface to the SPSR. For real-time messages, the NPG only converts blocks into a format that CCS can interpret.

D.3.2.1.1 Scheduling, TSW, and Acquisition Data Messages

A 4800BB customer cannot communicate directly with the SPSR. Therefore, the NPG transparently serves as a proxy client establishing the necessary service connections and performing the necessary protocol conversions. Because of the Nascom IP transition, a Small Conversion Device (SCD) is also required to simulate this interface. The SCD performs the protocol translation between pure 4800BB and UDP-encapsulated 4800BB. It should be restated here that the Nascom UDP-encapsulation also uses an RTP payload for certain fields. This interface and its related protocols are illustrated in the following figure.

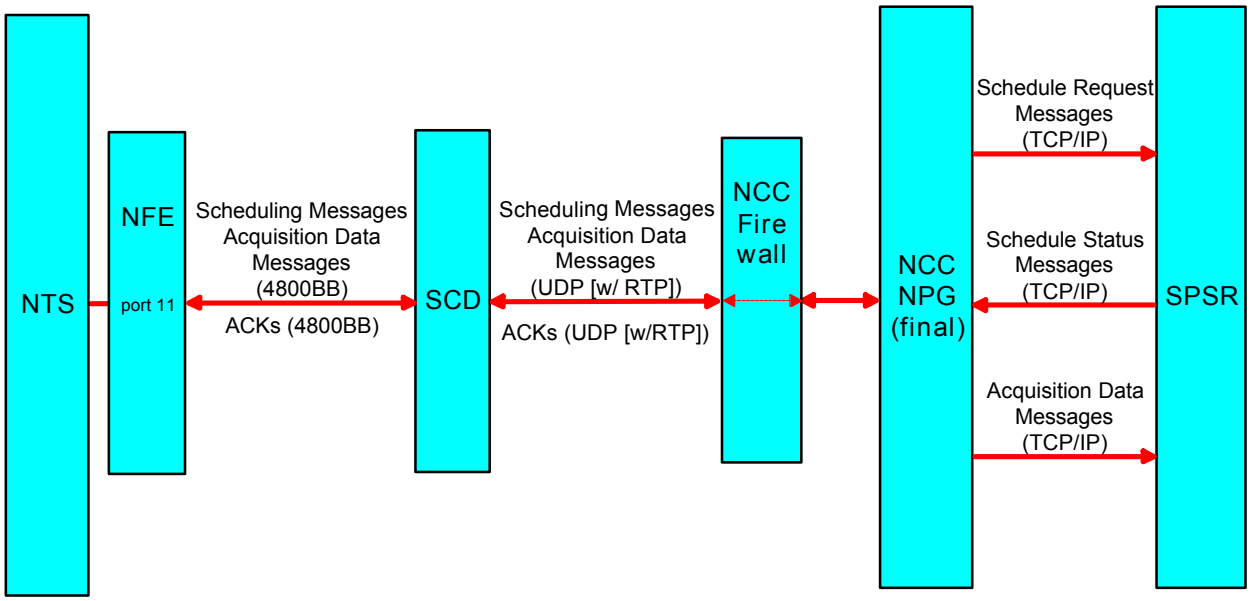

Figure D-9. Scheduling, TSW, and Acquisition Data Messages From 4800BB Customers

As the pure 4800-bit block leaves the NTS NFE it is immediately captured by the SCD in front of the NTS. The SCD encapsulates the 4800BB into a RTP payload and then into a UDP datagram. The UDP datagrams are then sent across the simulated Nascom IP network through the NCC Firewall (NFW) to the NCC NPG. The NCC NPG collects all of the datagrams associated with a single message. When the message is complete, the NPG creates a TCP/IP message and sends it across the appropriate service connection to the SPSR.

As before, the SPSR does not transmit or process 4800BB acknowledgments. Therefore, if the NTS responds with an acknowledgment it would be received by the SCD, converted to a UDP (with RTP) datagram, and routed over the simulated Nascom IP network to the NPG, where it would be consumed. For messages originating at the NCC, failure to receive such an

acknowledgment will cause the NCC NPG to begin retransmissions in accordance with current Nascom protocol. Failure of three transmissions will cause the NCC NPG to abort the service connection between the NCC NPG and the SPSR. For messages originating from the NTS, the NPG is responsible for responding with the UDP-encapsulated (with RTP) 4800BB acknowledgment. Failure to receive the acknowledgment will cause the NTS to retransmit the message in accordance with Nascom protocol. However, failure of three transmissions does not have any effect on the NTS.

D.3.2.1.2 Real-Time Messages

With the changes for the Nascom IP transition, a 4800BB customer can no longer communicate directly with the NCCDS. This interface requires a Small Conversion Device (SCD) to perform the protocol translation between pure 4800BB and UDP (with RTP)-encapsulated 4800BB. The NCC NPG performs the protocol conversion between UDP with RTP and UDP without RTP for CCS. This interface and its related protocols are illustrated in Figure D-10.

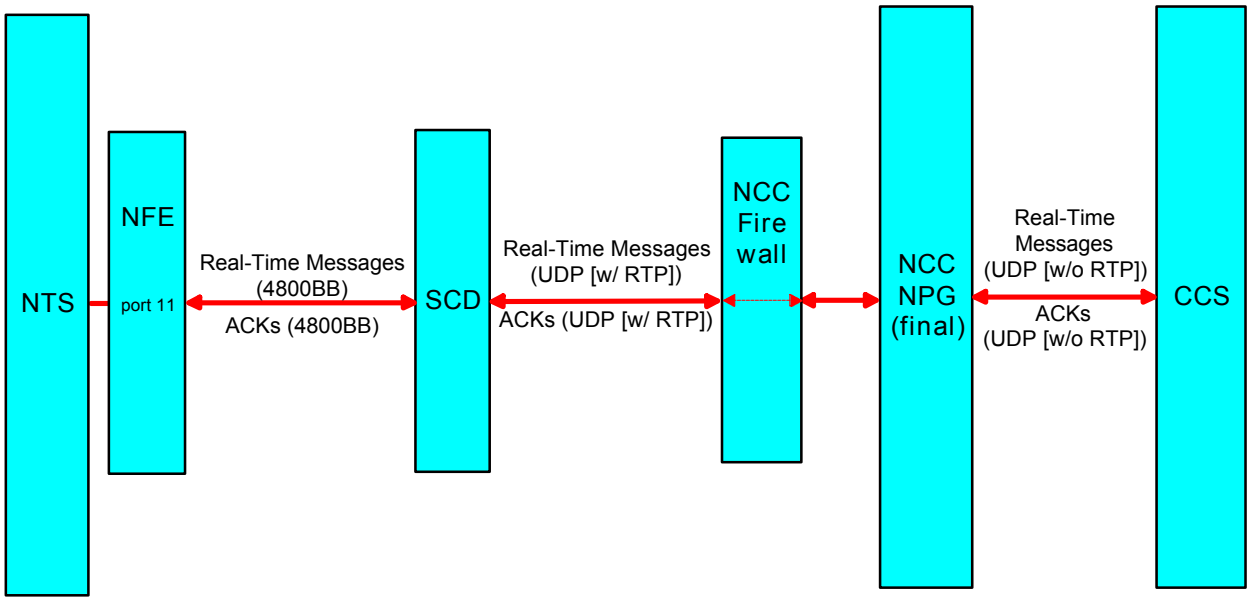

Figure D-10. Real-Time Messages From 4800BB Customers

As the pure 4800-bit block leaves the NTS NFE it is immediately captured by the SCD in front of the NTS. The SCD encapsulates the 4800BB into a RTP payload and then into a UDP datagram. The UDP datagrams are then sent across the simulated Nascom IP network through the NCC Firewall (NFW) to the NCC NPG. The NCC NPG decapsulates the UDP with RTP datagram and re-encapsulates it without the RTP payload. The NCC NPG then sends it across the OpsLAN to the CCS.

For this interface, both endpoints require the 4800BB acknowledgment message. Therefore, if the NTS responds with an acknowledgment it would be received by the SCD, converted to a UDP (with RTP) datagram, and routed over the simulated Nascom IP network through the NFW to the NCC NPG. The NPG determines that the acknowledgment is in response to a CCS message, encapsulates the acknowledgment in a UDP (without RTP) datagram addressed to the CCS. Failure to receive such an acknowledgment will cause the CCS to begin retransmissions in

accordance with current Nascom protocol. Failure of three transmissions will cause the CCS to logically "down" the site, inhibiting further transmissions to that destination. For a message originating from the NTS that is routed to the CCS for processing, the CCS is responsible for responding with the 4800BB acknowledgment. Failure to receive the acknowledgment will cause the NTS to retransmit the message in accordance with Nascom protocol. However, failure of three transmissions does not have any affect on the NTS.

D.3.2.2 TCP/IP Customers

The interface between the NCCDS and those customers that implement TCP/IP communications protocol will vary according to the type of messages is being exchanged and whether the customer is using Kerberos or not. For scheduling and acquisition data messages, the customer will have a direct TCP/IP interface with the SPSR. This interface will provide service connections for both Kerberised services and "open" services. For real-time messages, the NPG acts as a proxy server for the NCCDS and converts the TCP/IP messages into UDP-encapsulated blocks that CCS can interpret. Like the SPSR, the NPG will support both Kerberised service connections and "open" ones.

D.3.2.2.1 Scheduling and Acquisition Data Messages

TCP/IP customers will establish service connections directly with the SPSR. These connections and subsequent messages must pass through the NFW. Because the NTS will remain 4800BB-based, simulation of a TCP/IP customer will require a second NPG, hereafter referred to as the NTS NPG. Due to the Nascom IP transition, the NPG communicates in encapsulated 4800BB, not pure 4800BB. Therefore, a SCD is required for this encapsulation. Kerberised service connections also require the NCC Key Distribution Center server in order to simulate the I&A activities necessary when establishing the service connections. The NTS NPG will have the necessary Kerberos clients for simulating Kerberised service connections, including the use of encryption. The "open" service interface and its related protocols are illustrated in Figure D-11.

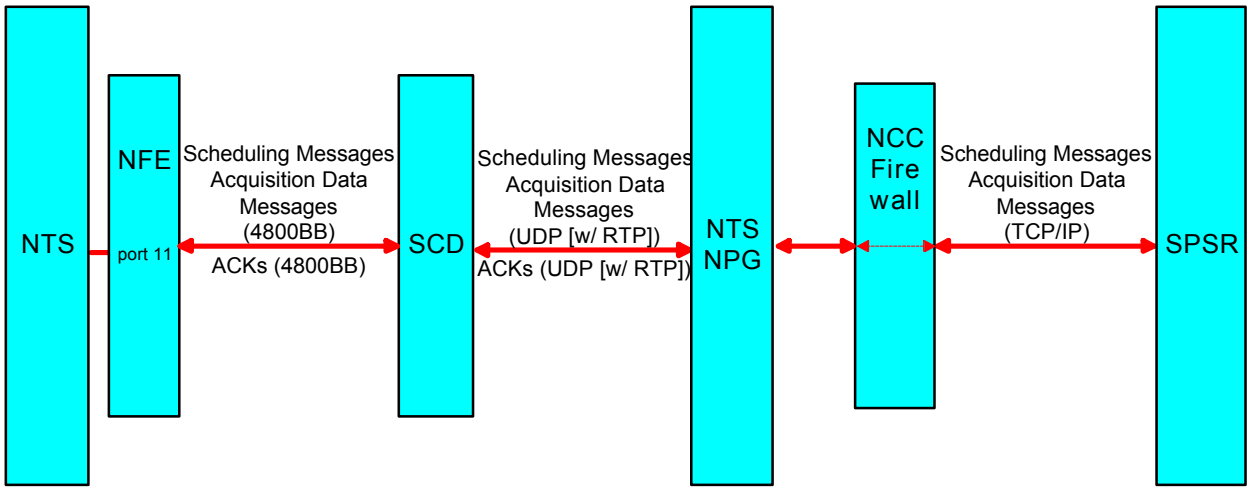

Figure D-11. Scheduling and Acquisition Data Messages From TCP/IP Customers

The applicable service connections (assume "open" service connections) to the SPSR are established via the NTS NPG. A message exits the NTS NFE as a pure 4800BB message. As the pure 4800-bit block leaves the NTS NFE it is immediately captured by the SCD in front of

the NTS. The SCD encapsulates the 4800BB into a RTP payload and then into a UDP datagram. The UDP datagrams are addressed to be received by the NTS NPG. The message is converted to TCP/IP and routed across the applicable service connection, through the NFW, to the SPSR.

Because SPSR does not transmit or process 4800BB ACKs, the NTS NPG is responsible for generating and consuming the necessary acknowledgments to satisfy the NTS.

D.3.2.2.2 Real-Time Messages

TCP/IP customers will establish service connections directly with the NCC NPG, which acts as a proxy server for the CCS. These connections and subsequent messages must pass through the NFW. Because the NTS will remain 4800BB-based, simulation of a TCP/IP customer will require the NTS NPG. Due to the Nascom IP transition, the NPG communicates in encapsulated 4800BB, not pure 4800BB. Therefore, a SCD is required for this encapsulation. Kerberised service connections also require the NCC Key Server in order to simulate the I&A activities necessary when establishing the service connections. The NCC NPG will have the necessary Kerberos servers for simulating Kerberised service connections, including the use of encryption.

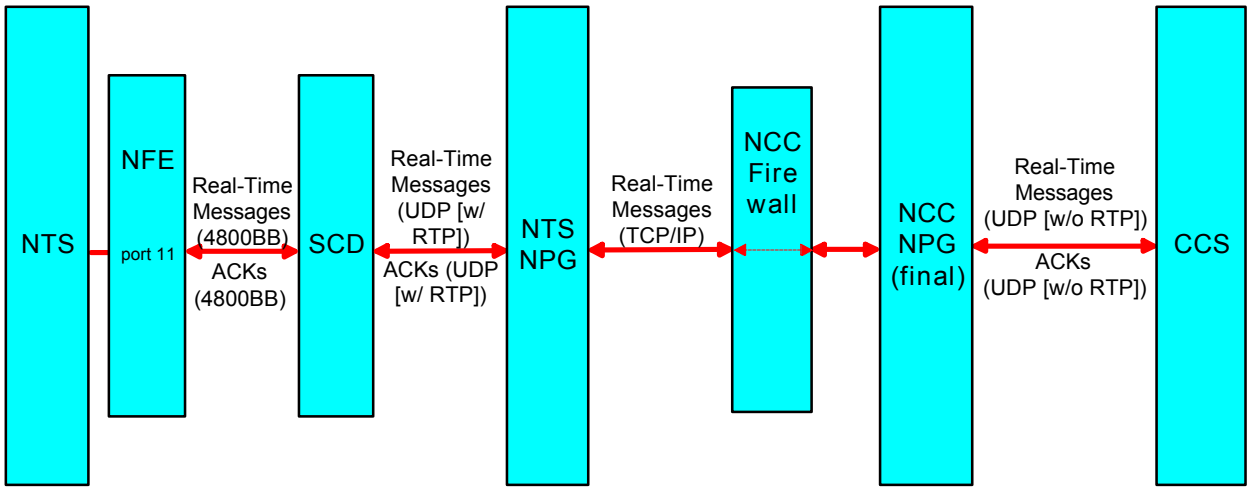

Figure D-12. Real-Time Messages From TCP/IP Customers

The applicable service connections (assume "open" service connections) to the NCC NPG are established via the NTS NPG through the NFW. A message exits the NTS NFE as a pure 4800BB message. As the pure 4800-bit block leaves the NTS NFE it is immediately captured by the SCD in front of the NTS. The SCD encapsulates the 4800BB into a RTP payload and then into a UDP datagram. The UDP datagrams are addressed to be received by the NTS NPG. The message is converted to TCP/IP and routed across the applicable service connection, through the NFW, to the NCC NPG. The NCC NPG then converts the TCP/IP message into UDP-encapsulated (no RTP) 4800BBs addressed to the CCS. As before, this conversion requires the NPG to provide necessary "Nascom information" into the 4800BB header. Thus, it is very important that the "Nascom information" tables on the NCC NPG are in sync with those on the NTS NPG.

In this simulation, both endpoints require 4800BB acknowledgments. As in the previous interface, the NTS NPG is responsible for generating and consuming the necessary

acknowledgments to satisfy the NTS. Likewise, the NCC NPG is responsible for generating and consuming ACKs as necessary to satisfy the CCS.

D.3.3 Support Facilities

The simulation of SDPF and any additional support facilities mirrors that of the customers presented in the previous sections. This simulation, as described above, will vary depending on the protocol implemented at the facility. Currently, it is anticipated that the SDPF will remain 4800BB-based in the NCCDS 98 era.

Abbreviations and Acronyms

2TB	2nd test berth
3TB	3rd test berth
4800BB	4800-bit block
ABR	Abbreviations
ACK	acknowledgment
ACQ/TRK	acquisition/tracking
ACRS	Automated Conflict Resolution System
AIS	Automated Information System
API	Application Programming Interface
ARP	address resolution protocol
AT	acquisition and tracking
ATRR	acceptance test readiness review
BDSR	build development status review
BVP	block validation processor
BVT	build verification test
CC	configuration code
CCPR	configuration and control process
CCR	Configuration Change Request
CCS	communications and control segment
CCTV	closed-circuit television
CD	compact disk
CDR	critical design review
CM	configuration management
CNE	center-wide network enterprise
CONFIG	configuration
CORBA	Common Object Request Broker Architecture
COUG	NCCDS Console Operator User's Guide
COTS	Commercial Off-The-Shelf

CRR	completion readiness review
CSC	Computer Sciences Corporation
CSR	completion status review
CSS	Control and Status System
CTM	communication test message
DAT	digital audio tape
DB	database
DBA	data base administrator
DBC	data base certification
DBMS	data base management system
DCL	data control language
DCN	document change notification
DDS	digital data storage
DEV	development
DFCD	data format control document
DI	design issue
DNS	Domain Name Service/Server
DQM	data quality monitoring
DSI	delivered source instruction
DT&T	Development, Test, and Training
EIF	engineering interface
ETE	end-to-end
EM	Event Monitor
ENCC	Emergency NCC
EPROM	erasable programmable read-only memory
FDF	Flight Dynamics Facility
FEL	Front-End LAN
GB	gigabit(s)
GCM	ground control message
GCMR	ground control message request
GSFC	Goddard Space Flight Center

GSS	General Security Services
GT	ground terminal
GUI	Graphical User Interface
HSC	high-speed controller
HDRM	high data rate multiplexer
HP	Hewlett-Packard™
ICD	interface control document
ID	identification
IFL	inter-facility link
IGMP	Internet Group Management Protocol
INPG	Interim NCC Protocol Gateway
IIR	interface incident report
IIRV	improved interrange vector
IP	Internet Protocol
ISD	internal software delivery
ISN	intersegment network
ISPR	integration software problem report
ISTE	Intermediate SPSR Test Environment
ITRR	Integration Test Readiness Review
ITS	Intelligent Terminal System
JISTT	Joint Integration and System Test Team
JSC	Johnson Spaceflight Center
KDC	Key Distribution Center
KF	K-band forward
KR	K-band return
KSA	K-band single access
KSAF	K-band single access forward
KSAR	K-band single-access return
LAN	local area network
LDT	long-duration test
MA	multiple access

MAF	multiple access forward
MAR	multiple access return
MB	megabit(s)
MDM	multiplexer/demultiplexer
MHz	Megahertz
MO&DSD	Mission Operation & Data Systems Directorate
MOC	Mission Operations Center
MSS	message switching system
NACC	NCC automated configuration controller
NASA	National Aeronautics and Space Administration
Nascom	NASA communications
NCC	Network Control Center
NCCDS	Network Control Center Data System
NCD	NCC Central Delogger
NES	Nascom Event Schedule
NFE	NCC front end
NM	Network Monitor
NMOS	Network Maintenance and Operations Support
NOC	Nascom Operation Center
NPG	NCC Protocol Gateway
NRI	NCC Requirement Input
NSM	Network and System Manager
NTS	NCC Test System
OCR	Operations Control Room
ODM	operations data message
OE	operations engineer
OUIS	operations user interface subsystem
PBM	performance benchmark
PC	personal computer
PDL	program design language
PDR	preliminary design review

PEDB	project engineering data base
PERF	performance analyst
POCC	Payload Operations Control Center
PROM	Programmable Read-Only Memory
PRRB	Problem Report Resolution Board
QA	quality assurance
QAO	QA officer
RAP	restricted access processor
rev	revision
RL	Release Leader
RnBm	Release n, Build m
ROM	Read-Only Memory
RSIM	return simulation
RTP	real-time protocol
SA	single access
SAR	schedule add request
SAS	Service Accounting System
SBC	single board computer
SC	security criticality
SCD	Small Conversion Device
SCHD	Scheduler
SCR	system change request
SDE	SPSR Development Environment
SDF	Software Development Facility
SDPF	Sensor Data Processing Facility
SE	System Engineering
SEAS	Systems, Engineering, and Analysis Support
SEN	software engineering notebook
SERF	Software Engineering Research Facility
SF	S-band forward
SGLT	space-to-ground link terminal

SHO	scheduled service order
SIC	spacecraft identification code
SLR	service level report
SN	Space Network
SNMP	Simple Network Management Protocol
SPR	software problem report
SPSR	service planning segment replacement
SQL	Structured Query Language
SR	S-band return
SRM	schedule result message
SRR	schedule result request
SSA	S-band single access
SSAF	S-band single access forward
SSAR	S-band single access return
SSDM	SEAS System Development Methodology
SSMNU	System Supervisor Menu
STGT	Second TDRSS Ground Terminal
STDN	Space Tracking and Data Network
STR	system trouble report
STRR	system test readiness review
SUPIDEN	support identifier
SYST	System Supervisor
TBD	to be determined
TBS	to be supplied
TCP	Transmission Control Protocol
TDRS	Tracking and Data Relay Satellite
TDRSS	Tracking and Data Relay Satellite System
TLAS	TDRS Look-Angle System
TM	technical manager
TNC	TDRSS network controller
TQM	total quality management

TRB	technical review board
TSW	TDRS Scheduling Window
TUT	TDRS Unscheduled Time
UDP	User Datagram Protocol
UDS	Universal Data System
UI	user interface
UPD	user performance data
UPS	User Planning System
USM	user schedule message
UTC	Universal Time Coordinate
UTAS	Utility Active Schedule
UTES	Utility Event Sequencer
VAX	virtual address extension
VMS	virtual memory storage
W/S	Workstation
WSC	White Sands Complex
WSGTU	White Sands Ground Terminal Upgrade